

# VOLVO

## Service Manual

Fault tracing

Design

Repair

Function

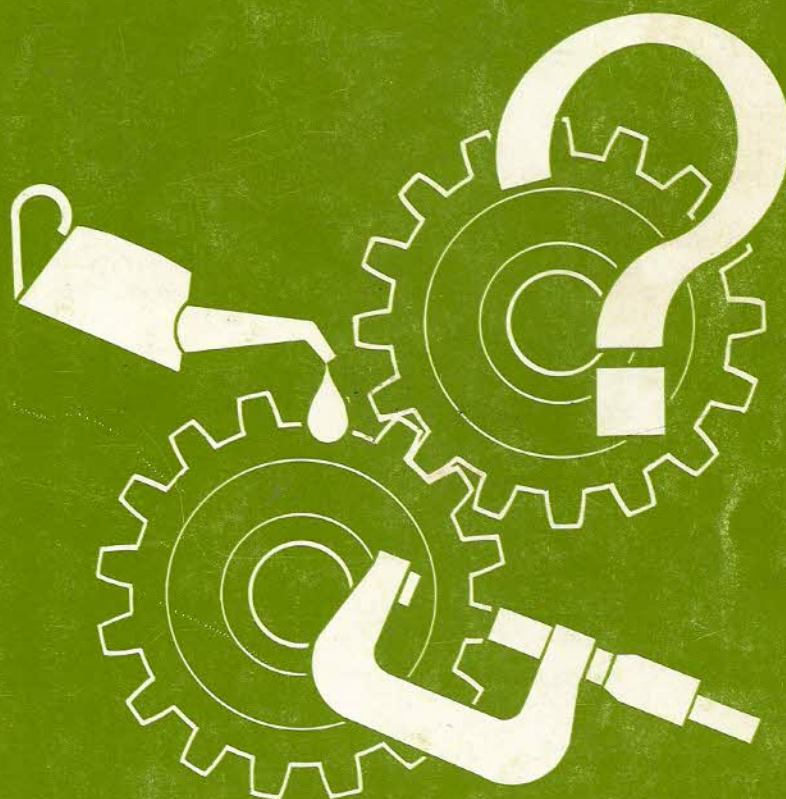
Maintenance

Section 4 (43)

Automatic  
transmissions  
AW 70/70 L  
AW 71/71 L  
AW 72 L

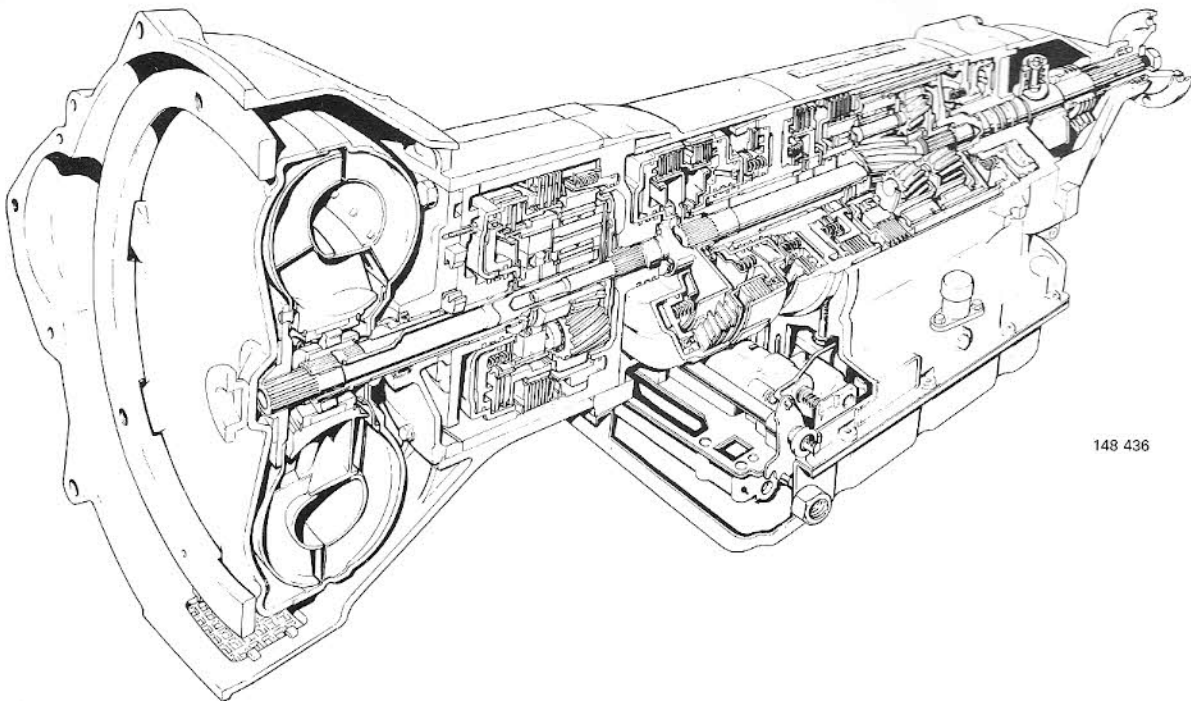
700, 1982-19..

TP 31642/1



Volvo Cars North America

**AW 70/AW 70 L  
AW 71/AW 71 L  
AW 72 L**



148 436

**Modifications to February 1990 included**

Modifications introduced after the above date are not covered by this manual. See service bulletins as applicable.

Volvos are sold in versions adapted for different markets. These adaptations depend on many factors including legal, taxation and market requirements.

This manual may therefore show illustrations and text which do not apply to cars in your country.

Volvo owners planning to export their car(s) to another country should investigate the applicable safety and exhaust emission requirements. In some cases it may be impossible to comply with these requirements.

© VOLVO CARS NORTH AMERICA

A division of Volvo North America Corporation

## Contents

	Page
<b>Design and function</b> .....	2
<b>Specifications</b> .....	29
<b>Special tools</b> .....	46
<b>Fault tracing procedures</b> .....	48
<b>Repair and maintenance procedures</b> .....	57

See Service Manual, Section 4 (43), TP 31635/1 for reconditioning procedures.

**Ordering No. TP 31642/1**

This manual supersedes the following sections of earlier manuals as follows:

TP 30687/1, pages 5–9 and 47–83

TP 30754/1, pages 21–43

(However, the above publications remain applicable to AW 55/BW 55 transmissions.)

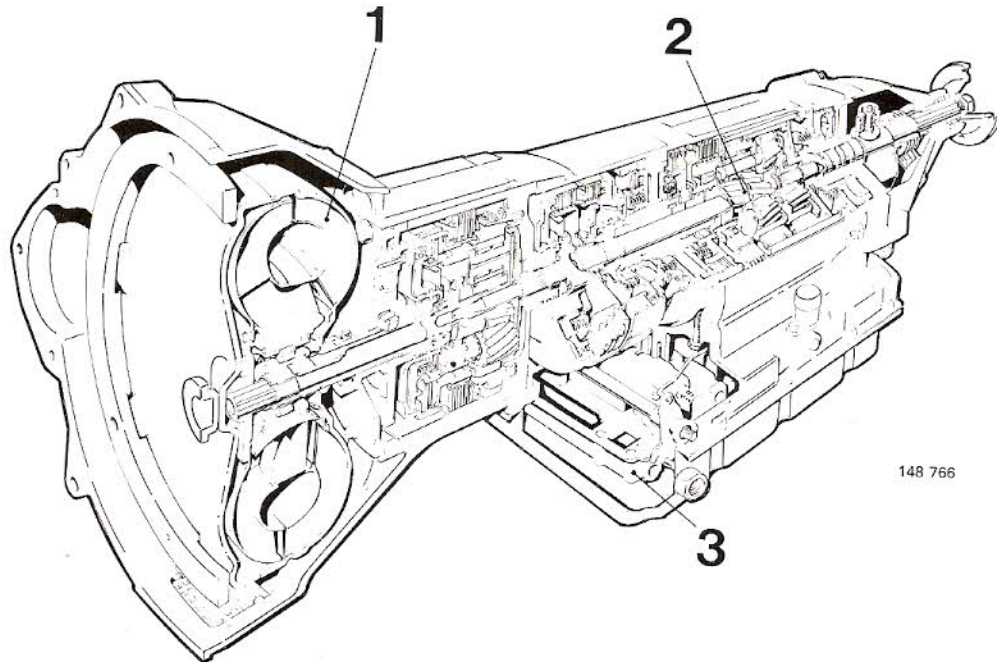
We reserve the right to make alterations without prior notification.

# Design and function

## Contents

	Page
<b>General</b> .....	2
Torque converter .....	3
Planetary gearbox .....	4
Hydraulic control system .....	6
<b>Design and function</b> .....	7
Introduction .....	7
Torque converter with lock-up .....	8
Planetary gearbox .....	11
Hydraulic system .....	16
Hydraulic control system .....	19
Gear selector mechanism .....	24
Kickdown inhibitor .....	27

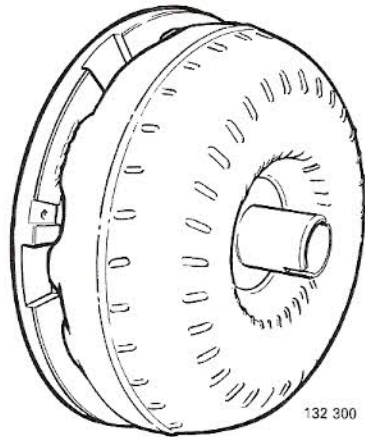
## General



148 766

The **AW 70/70 L**, **AW 71/71 L** and **AW 72 L** automatic transmissions are of the same basic construction. Each consists of the following main components:

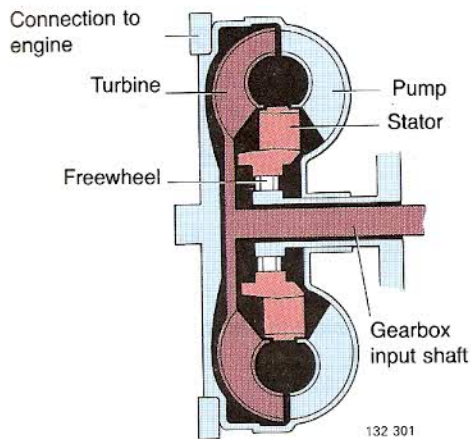
- 1** Hydraulic torque converter
- 2** Mechanical planetary drive gearbox and
- 3** Hydraulic control system for gearbox operation.



132 300

## Torque converter

The torque converter acts as a fluid coupling which transmits the drive from the engine to the gearbox, providing smooth transmission of power to the driving wheels and adding to the torque delivered by the planetary gearbox.



132 301

The torque converter consists of a pump, stator and turbine.

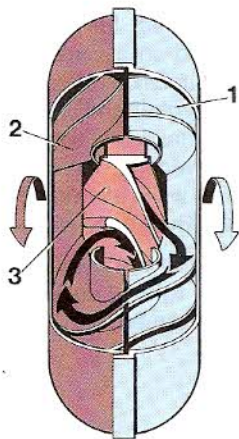
Rotating at engine speed, the pump (1) delivers hydraulic fluid to the turbine (2) through the stator vanes (3). After driving the turbine, the fluid is returned to the pump.

The pump, stator and turbine vanes are designed so that the angle of fluid discharge from the turbine is altered by the stator vanes when a difference exists between the pump and turbine (i.e. engine and gearbox) speeds. Under these conditions, the fluid helps to drive the pump and the stator is locked in position by the freewheel (or one-way clutch), producing a torque multiplication varying from approx. 2:1 to 1:1.

The 2:1 ratio is obtained when the turbine (i.e. the car) is at rest. The ratio is 1:1 when the turbine speed reaches 90% of the pump speed.

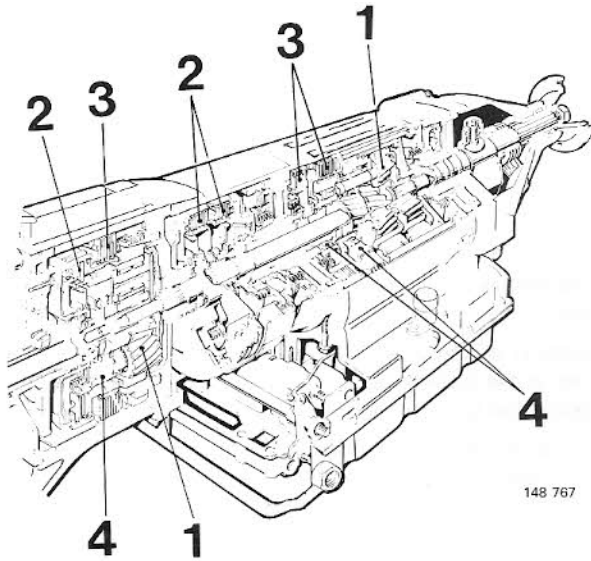
Under the latter conditions, the angle of fluid discharge from the turbine is such that the stator is driven in the same direction as the turbine and pump, and is no longer locked by the freewheel. The torque converter then functions as a fluid coupling with no torque multiplication.

However, some slip (or loss) inevitably occurs between the pump and turbine. Slip may be eliminated by introducing a 'lock-up' function. See under 'Torque converter with lock-up', pages 8-10.



132 302

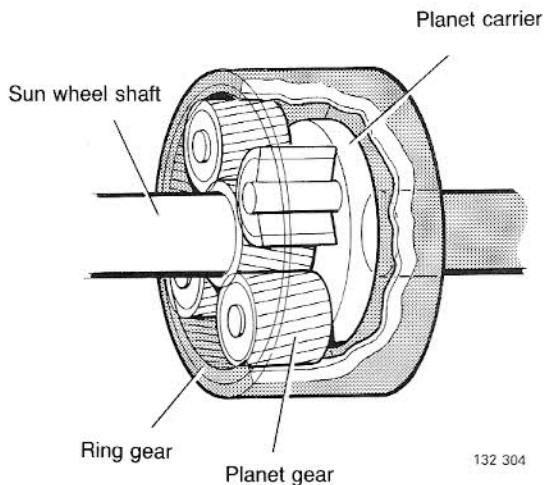
The AW 72L transmission, as well as certain AW 70 and AW 71 units, is equipped with a mechanical lock-up clutch which eliminates slip by locking the pump and turbine together when the car is driven in 4th gear above a certain speed. (AW 70 and AW 71 units with this feature are designated AW 70L and AW 71L respectively.) The lock-up function is described in further detail under 'Torque converter with lock-up' on pages 8-10.



### Planetary gearbox

The actual gearbox consists of a number of planetary (epicyclic) gear trains, clutches, brakes and freewheels.

- 1. Planetary gear train
- 3. Clutch
- 4. Brake
- 5. Freewheel

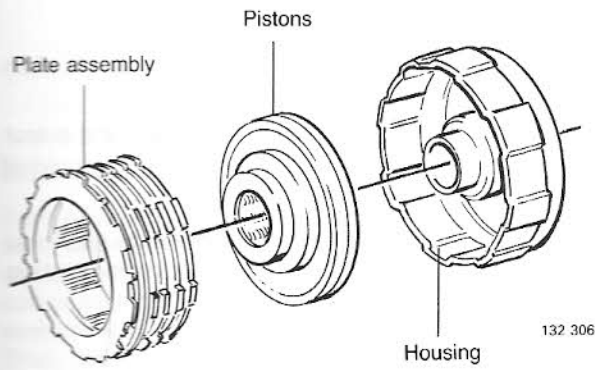


### Planetary gear train

The principle of a planetary gear train is as follows:

Mounted on a central shaft, the sun wheel is surrounded by planet gears mounted on a carrier, all enclosed in a ring gear (or annulus). In addition to transmitting power from the sun wheel to the ring gear and vice versa, the planets are also locked under certain conditions. Different speed ratios are obtained by preventing one or other of the three elements from rotating while allowing the others to turn. The train is disengaged when none of the elements is locked.

The main advantage of the planetary gear train is that it permits gear shifting without declutching, since the gears are in constant engagement.



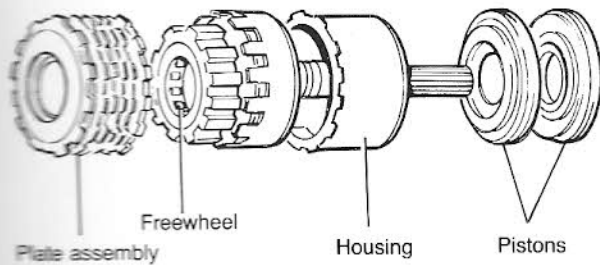
Principle of clutch C2

132 306

**Clutches**

The multi-plate clutches are operated by hydraulic pistons. The clutches transmit the driving power to various parts of the gearbox.

The clutches are engaged hydraulically in various combinations, depending on the particular gear selected.



Principle of brake B3

148 604

**Brakes**

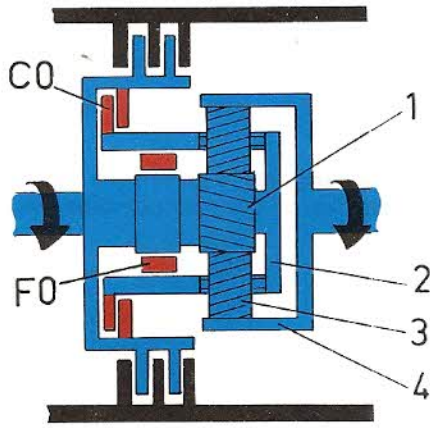
The non-adjustable, multi-plate brakes are operated by hydraulic pistons.

The brakes are used to lock various components of the gearbox.

**Freewheel**

The freewheel (or one-way clutch) prevents rotation in one direction and permits it in the other

General



132 320

- Non-rotating components
- Rotating at input shaft speed
- Speed higher than input shaft
- Speed lower than input shaft
- Engaged and power-transmitting components
- Manually-engaged components

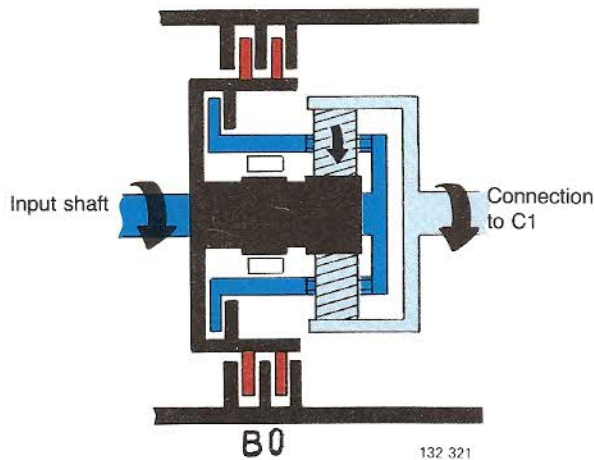
**Principle of operation**

The sun wheel (1) is locked to the planet carrier (2) when clutch C0 is engaged.

The train now rotates as a unit, and the input and output shaft speeds are the same.

This is known as the direct-drive mode.

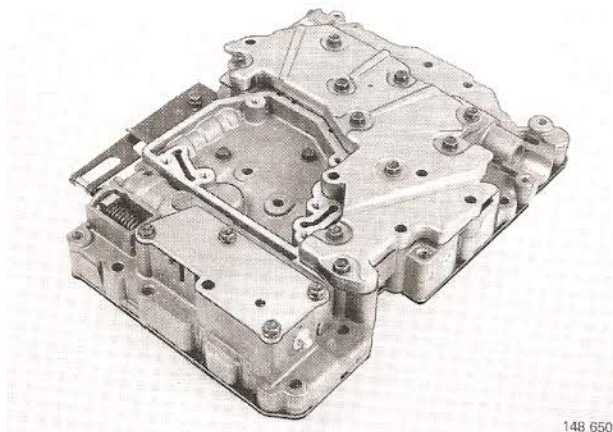
In this mode, the highest power is transmitted by freewheel F0. Clutch C0 transmits power only under engine braking conditions.



132 321

The sun wheel is locked and the planets are forced to orbit it by the planet carrier when brake B0 is applied. In addition, the planets simultaneously rotate about their own axes. The ring gear and output shaft now rotate at a higher speed than the input shaft.

A speed increase is achieved in this manner.



148 650

**Hydraulic control system**

The function of the hydraulic control system is to perform the actual gear-shifting operations and to determine which gear is to be selected at any time.

The system consists of a number of interacting hydraulic valves actuated by oil supplied under pressure by a pump driven by the torque converter.

The control system is described in further detail under 'Hydraulic control system' on pages 19–23.

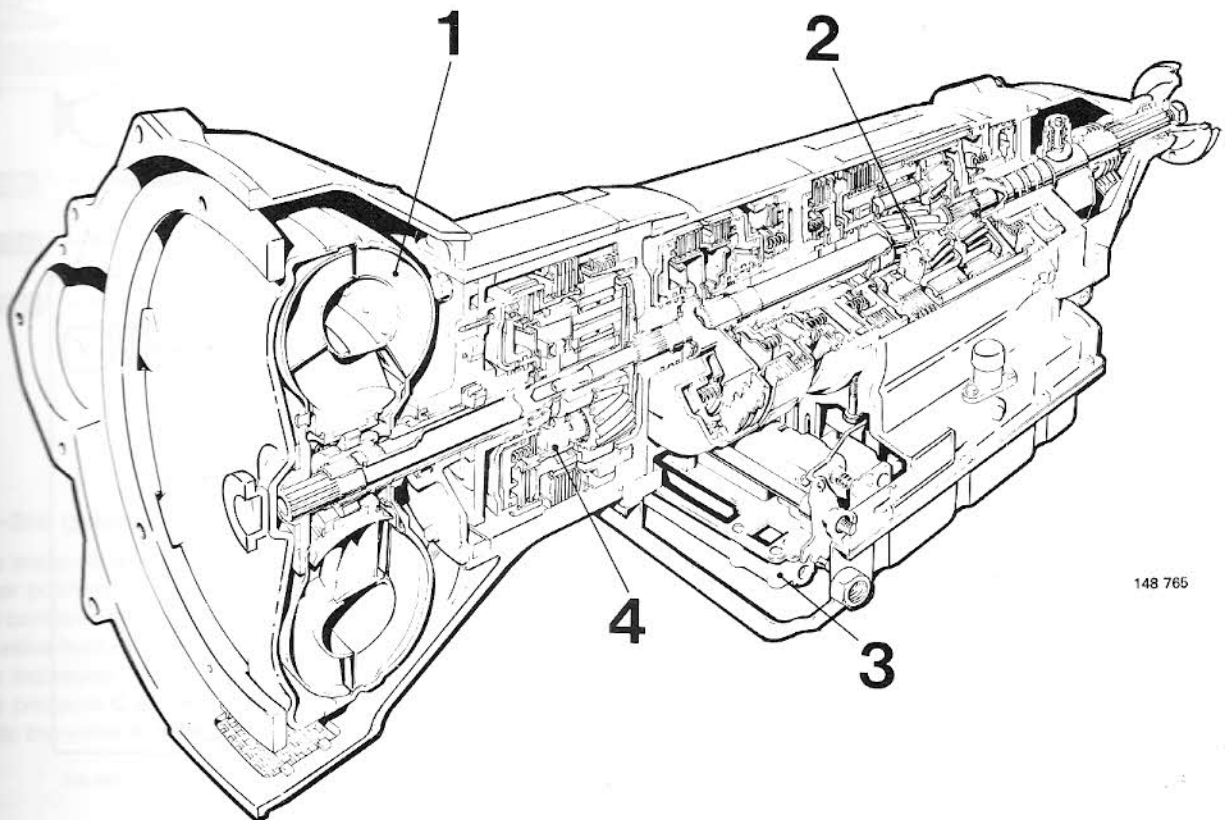
## Design and function

### Introduction

Each of the transmissions (all four-speed units) is of the same basic design. The main components are the torque converter (1), three-speed planetary gearbox (2), hydraulic control system (3) and overdrive (4th gear) unit (4). However, some differences do exist between the various types. Thus, AW 71 is a reinforced version of AW 70, while AW 72L affords different ratios by employing sun wheels of different diameters in planetary trains P1 and P2. Most

AW 72L transmissions are also equipped with a kickdown inhibitor between 3rd and 4th, as are some AW 71s.

AW 70 and AW 71 are available either with or without mechanical locking of the torque converter (a function known as lock-up). Versions with this feature are designated AW 70 L and AW 71 L respectively. All AW 72L units are equipped with lock-up.



148 765

1. Torque converter
2. Planetary trains P1 and P2
3. Hydraulic control system
4. Overdrive unit P0 (4th gear)

Torque converter with lock-up

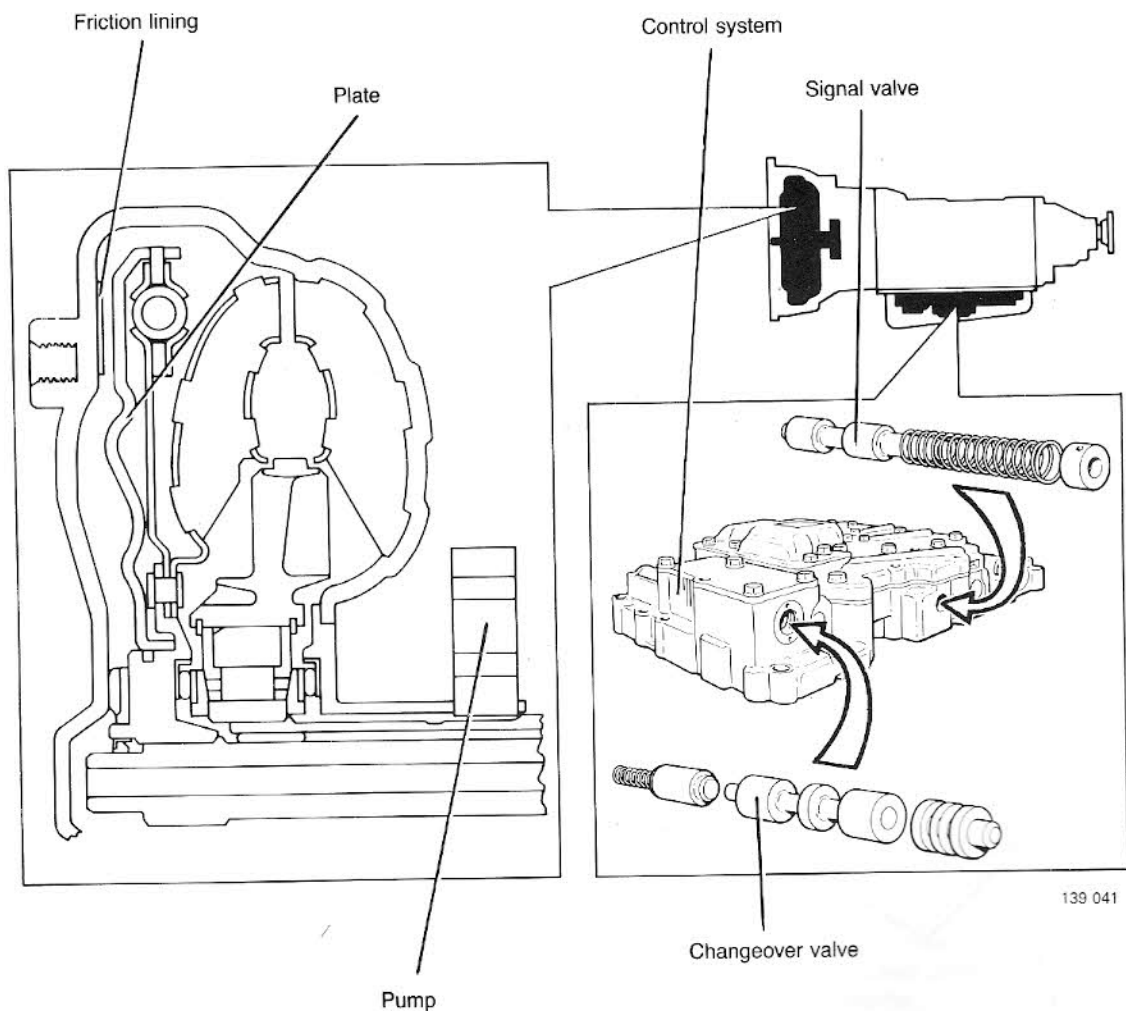
### Torque converter with lock-up

The torque converter is described under 'General' on page 3. This section will deal only with the mechanical lock-up function.

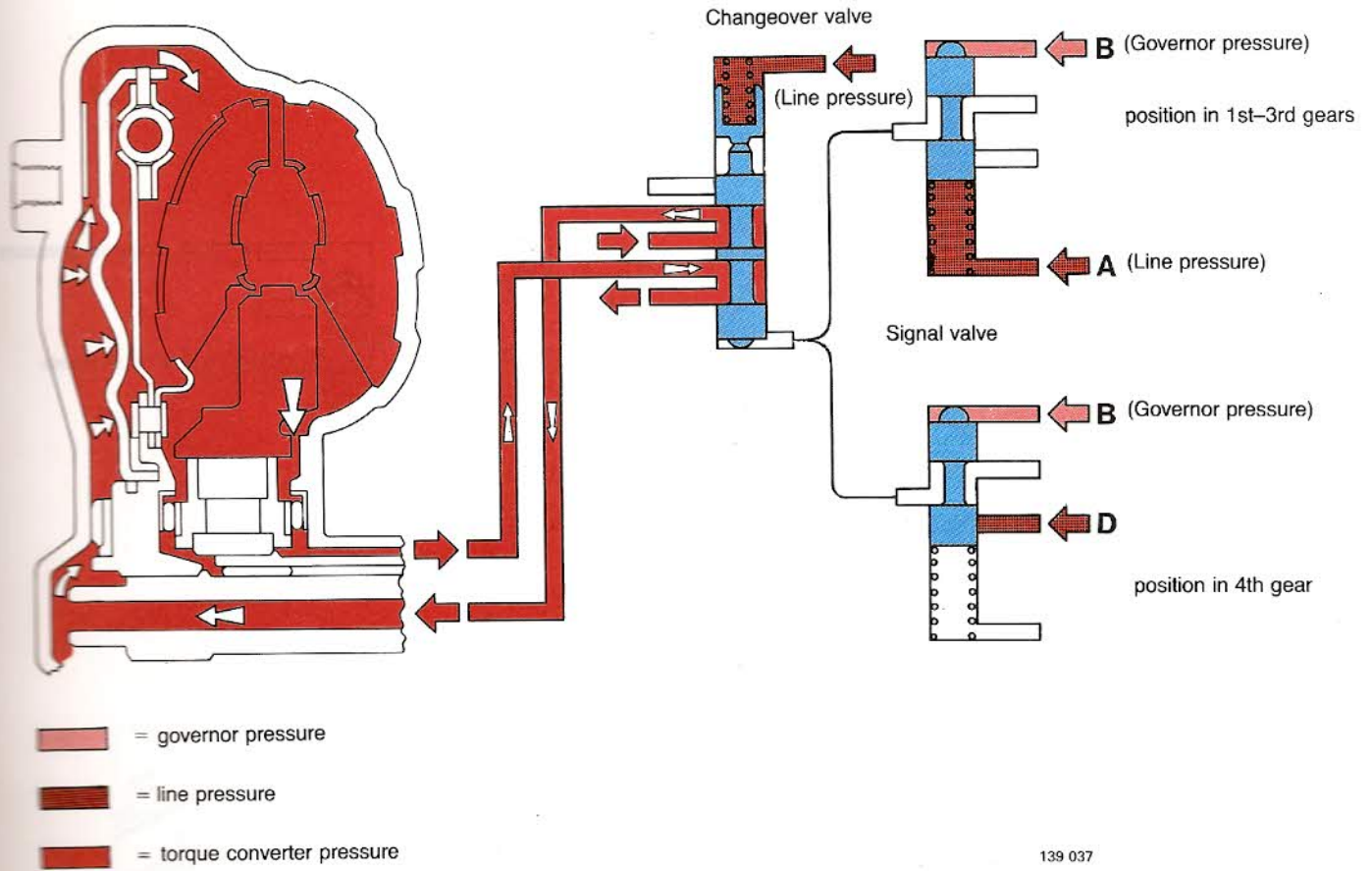
Power transmission is fully mechanical when the torque converter is locked by the lock-up clutch, thereby eliminating the slip which is an inevitable feature of the unit. Engine speed is reduced and a certain fuel saving is achieved.

The mechanism consists of a plate which is pressed into contact with the torque converter housing, the mating surface of which is provided with a friction lining.

Engagement and disengagement are controlled by the signal valve and changeover valve in the control system. (In the illustration below, the control system is shown with the underside facing upward.)



Lock-up function disengaged



139 037

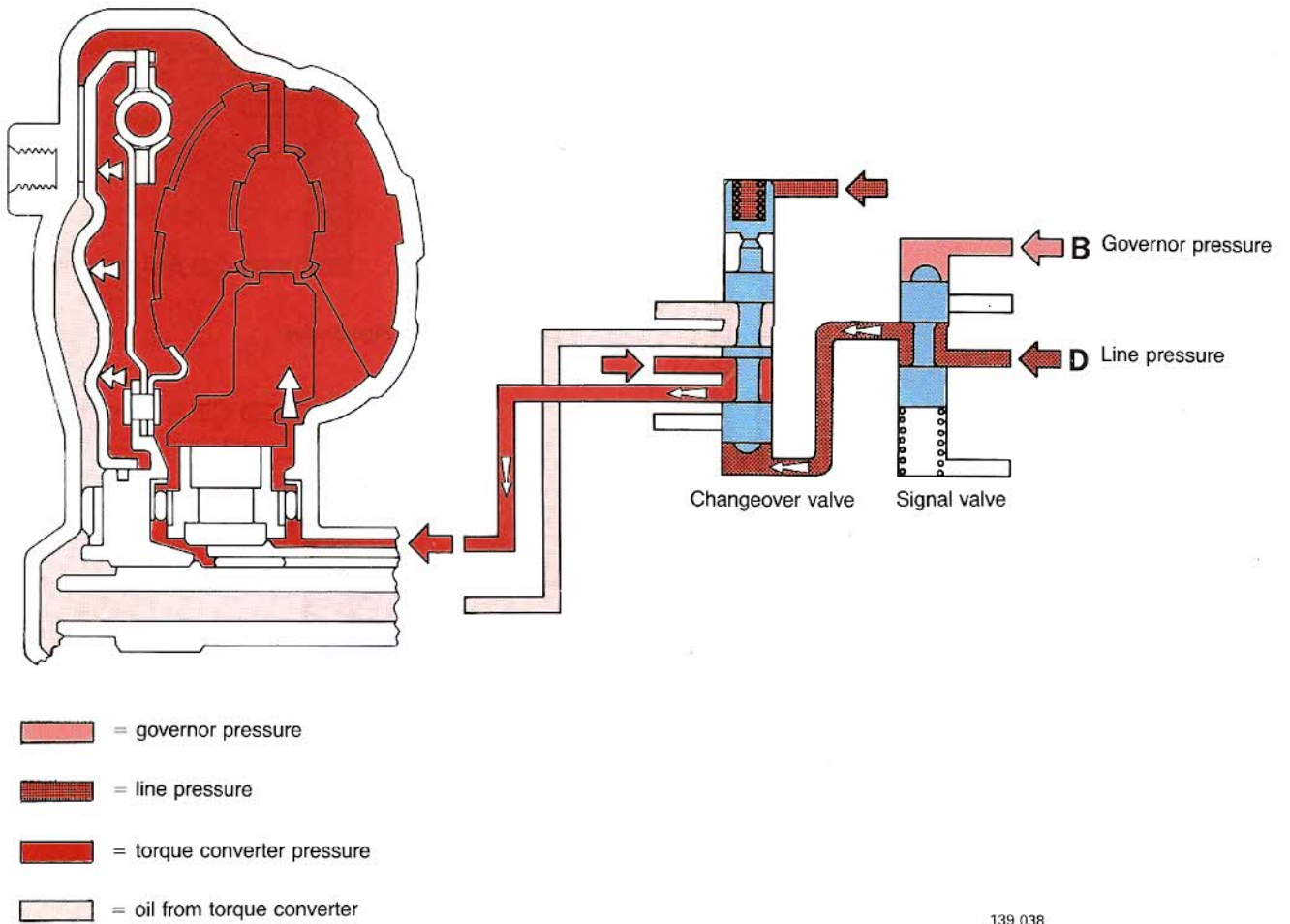
1st-3rd gears

Line pressure is supplied at **A** and the valve moves to the upper position.  
The combination of line pressure and spring force prevents the valve from moving downwards when governor pressure **B** is increased.  
Line pressure **C** applied to the top of the changeover valve holds the valve in the lower position.

4th gear

Line pressure is now supplied to the middle port **D** of the signal valve.  
Since the governor pressure **B** is not sufficiently high to move the valve downwards, the valve is held in the upper position by spring force.  
The changeover valve remains in the lower position.

Lock-up function engaged



139 038

4th gear only

The signal valve moves downwards when the governor pressure **B** is sufficiently high (i.e. when the car is driven above a certain speed).

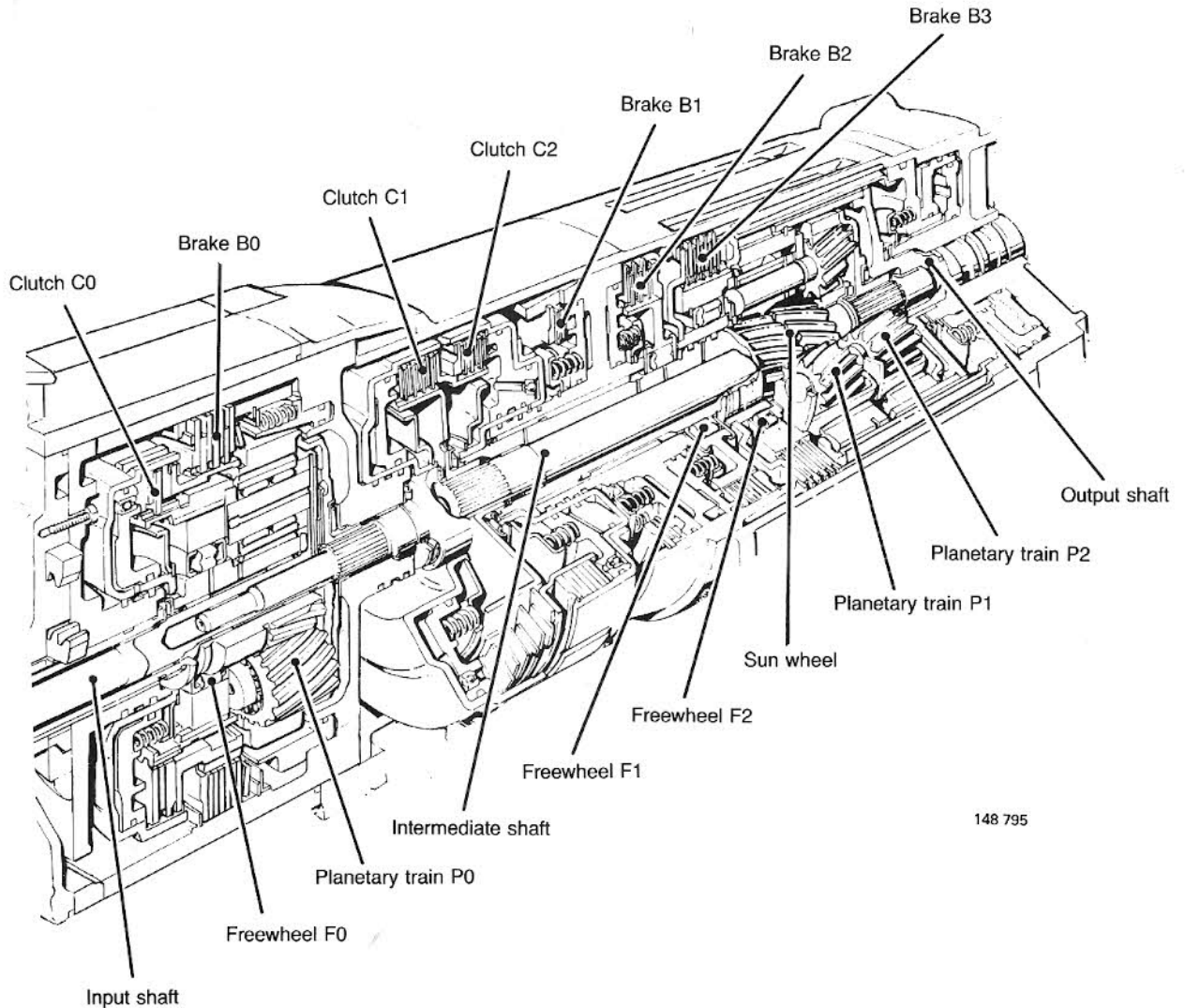
This admits line pressure **D** to the underside of the changeover valve, which moves upwards and permits oil to flow to

the torque converter in the opposite direction. This forces the lock-up clutch plate into contact with the friction lining on the housing, eliminating slip. Since the oil in the torque converter is now almost at rest, it does not require to be cooled.

## Planetary gearbox

The planetary gearbox, including the overdrive unit (4th gear), consists of three planetary gear trains, three clutches, three freewheels and four brakes.

### Components, 1st–4th gears



148 795

Four forward speeds and reverse are obtained by engaging the elements of the planetary trains in different combinations.

This is achieved by engaging and disengaging the hydra-

lically operated clutches and brakes.

The method of obtaining the different speeds is described in the following section 'Power flow through gearbox'.

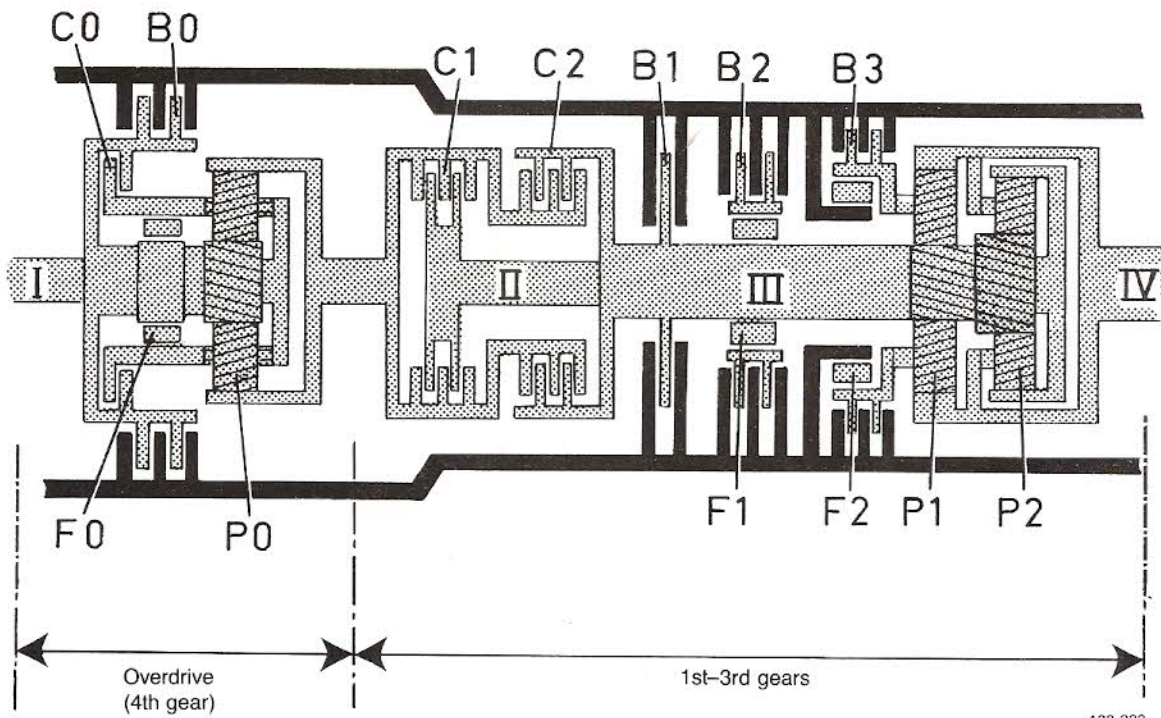
Planetary gearbox

**Power flow through gearbox**

Since 4th gear (overdrive) remains in the direct-drive mode in all gears other than 4th itself, the power flow through the overdrive unit is described only under '4th gear' below.

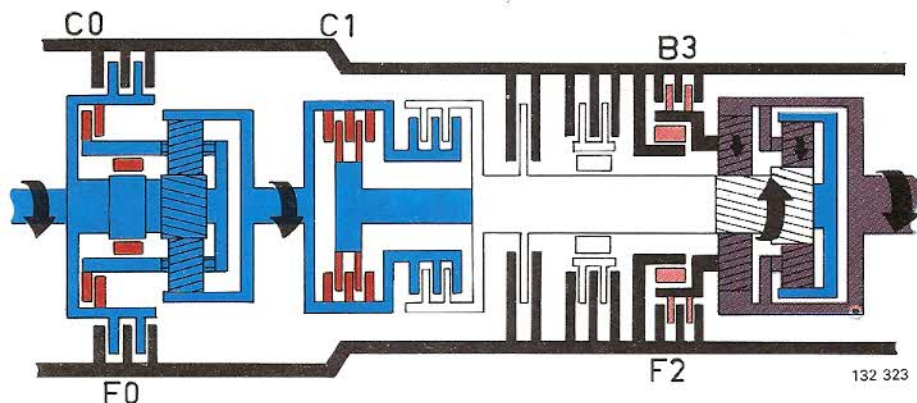
However, the flow is shown in each of the other cases to illustrate the flow through the gearbox as a whole.

The following components are used to transmit power in the different gears:



132 322

- |             |                       |                     |
|-------------|-----------------------|---------------------|
| B Brake     | P Planetary train     | III Sun wheel shaft |
| C Clutch    | I Input shaft         | IV Output shaft     |
| F Freewheel | II Intermediate shaft |                     |



- Non-rotating components
- Rotating at input shaft speed
- Speed higher than input shaft
- Speed lower than input shaft
- Engaged and power-transmitting components
- Manually-engaged components

**1st gear, selector in position D**

Both planetary trains (P1 and P2) transmit driving power, dividing the torque between them.

Front clutch C1 is engaged and transmits power from the input shaft, through the intermediate shaft, to the rear ring gear.

The rear ring gear forces the rear planets to rotate about their own axes, causing the planet carrier (which is rigidly attached to the output shaft) to rotate clockwise.

The rear planets simultaneously drive the sun wheel shaft counterclockwise at a speed determined by the front planetary train.

The front planet carrier is prevented from rotating counterclockwise by freewheel F2, causing the sun wheel to drive the front ring gear through its planets.

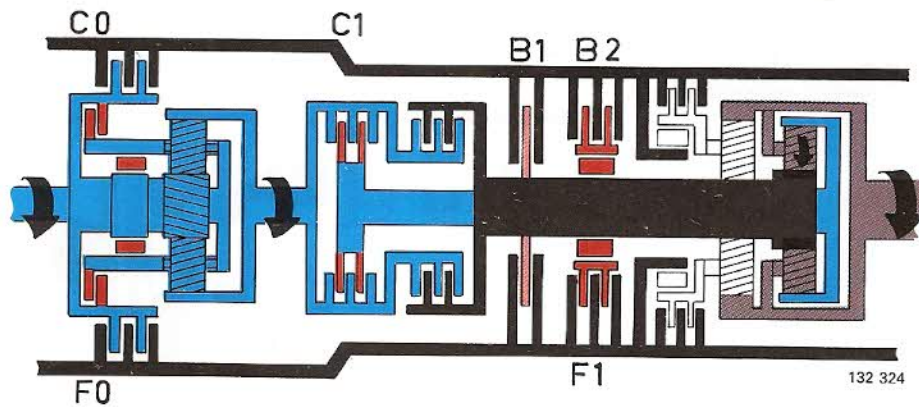
The front ring gear which (like the rear planet carrier) is rigidly attached to the output shaft, rotates clockwise.

Thus, power is transmitted in common by both front and rear trains at a ratio of 2.81:1 in the AW 72L, and 2.45:1 in the AW 70 and AW 71.

**Selector in position 1**

The difference between this and position D is that brake B3 is also applied, preventing the front planet carrier from rotating. The action of the brake means that torque is also transmitted from the output to the input shaft. In other words, engine braking is available in position 1.

Planetary gearbox



**2nd gear, selector in position D**

Only rear planetary train P2 transmits power, the front train rotating unloaded.

Front clutch C1 is engaged and transmits power from the input shaft, through the intermediate shaft, to the rear ring gear.

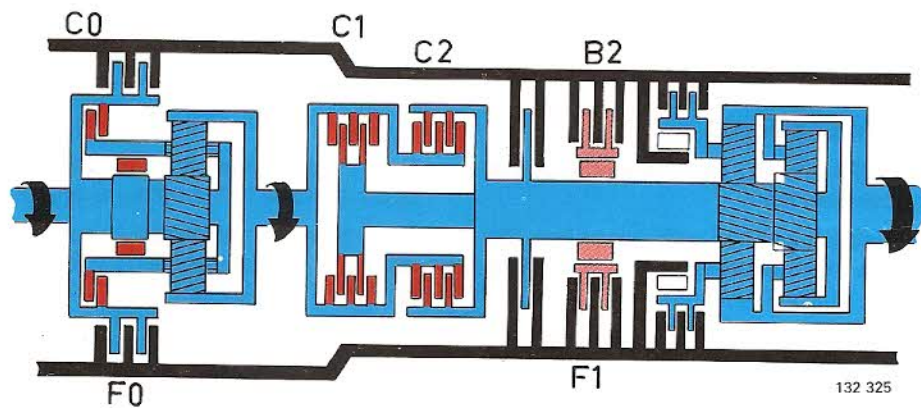
The resultant tendency of the rear planets to drive the sun wheel shaft counterclockwise is prevented by freewheel F1. (The outer hub of the freewheel is locked by brake B2.)

The rear ring gear instead forces the planets to orbit the sun wheel, causing the planet carrier also to rotate at a reduced speed.

Since the rear planet carrier and output shaft are rigidly attached to each other, the output shaft will rotate at a reduced speed compared with the input shaft. The speed ratios are 1.49:1 in the AW 72 L and 1.45:1 in the AW 70/ AW 71.

**Selector in position 2**

The difference compared with D is that brake B1 is also applied to permit engine braking in 2nd. In this case, torque may also be transmitted **from** the output to the input shaft.



**3rd gear**

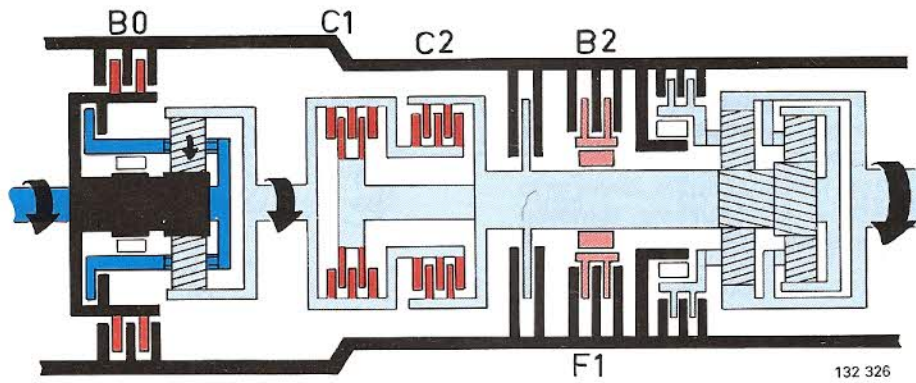
Both the front and rear clutches, C1 and C2, are engaged.

The complete planetary assembly rotates as a unit with no difference in reduction ratio or torque (Ratio 1:1).

**Note!**

Brake B2 is also applied in 3rd to facilitate downshifting from 3rd to 2nd. (If brake B2 – which is used in 2nd – is al-

ready applied, downshifting from 3rd to 2nd will be faster). As already described, brake B2 does not brake the sun wheel shaft, but only the outer hub of freewheel F1, enabling the sun wheel to rotate freely in 3rd. (In 2nd, on the other hand, the sun wheel is locked since it would otherwise rotate in the opposite direction.)



**4th gear  
(3rd + overdrive)**

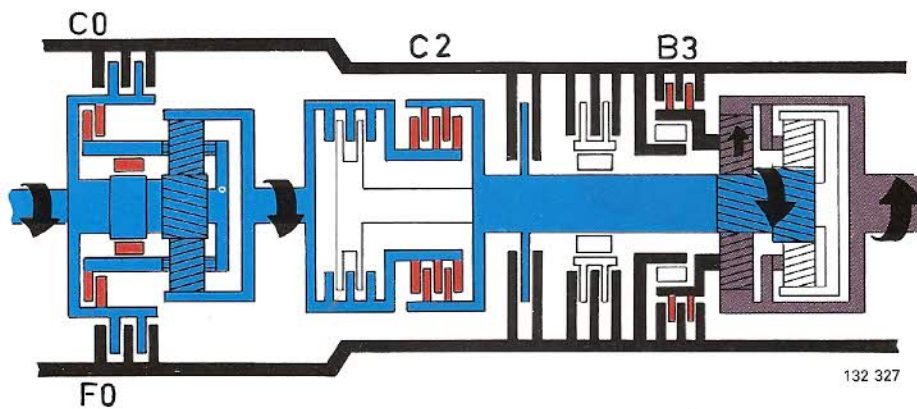
Fourth gear (overdrive), which is engaged automatically from 3rd, lowers the reduction ratio from 1:1 to 0.73:1 in the AW 72L and from 1:1 to 0.69:1 in the AW 70/AW 71.

Brake B0 is applied on engagement, locking the sun wheel in the overdrive unit.

The overdrive unit ring gear then rotates at a higher speed than the engine. This speed is transmitted to clutch C1 in

the gearbox, from whence the power is transmitted further to the output shaft as in 3rd gear (see above).

Overdrive may also be disengaged completely, permitting the gearbox to be used in 1st, 2nd and 3rd gears only. Disengagement is performed by means of a switch on the gear selector lever, a function described under 'Control system, manual downshift valve 4-3' on page 23.



**Reverse**

In reverse gear, power is transmitted only by front planetary train P1.

Clutches C0 and C2 are locked, connecting the input shaft to the sunwheel shaft. Brake B3 is applied, locking the front planet carrier.

As a result, the sun wheel shaft drives the front planets counterclockwise. These, in turn, drive the front ring gear (which is rigidly connected to the output shaft) counterclockwise.

**Neutral and parking positions**

Clutch C0 only is engaged 'ready' for starting (direct-drive mode).

All brakes are released, except in the parking position, in which brake B3 is applied while the engine is running.

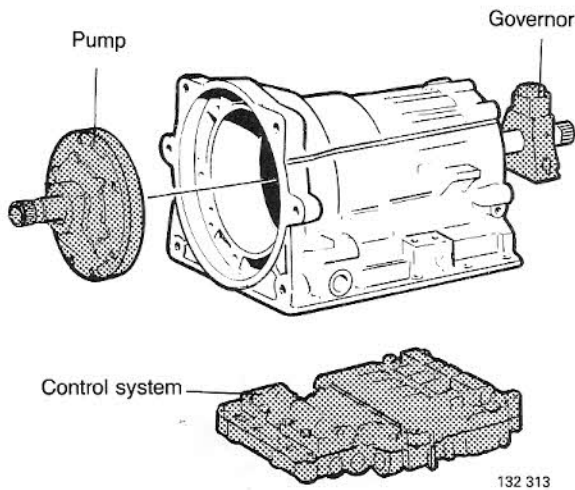
Planetary gearbox

Power flow

Gear selector position	Gear	Clutch(es) engaged	Planetary train(s) in use	Brakes applied	Freewheel(s)	Engine braking
P	—	C0 <sup>1)</sup>	—	B3 <sup>1)</sup>	—	—
R	reverse	C0, C2	front	B3	F0	yes
N	—	C0 <sup>1)</sup>	—	—	—	—
D	1st	C0, C1	both	—	F0, F2	no
	2nd	C0, C1	rear	B2	F0, F1	no
	3rd	C0, C1, C2	'direct-drive'	B2 <sup>2)</sup>	F0	yes
	4th	C1, C2	OD + 'direct-drive'	B0, B2 <sup>2)</sup>	—	yes
2	1st	C0, C1	both	—	F0, F2	no
	2nd	C0, C1	rear	B1, B2	F0, F1	yes
1	1st	C0, C1	both	B3	F0, F2	yes

<sup>1)</sup> With engine running.

<sup>2)</sup> Applied to facilitate gear shifting.  
Disengaged via freewheel F1.

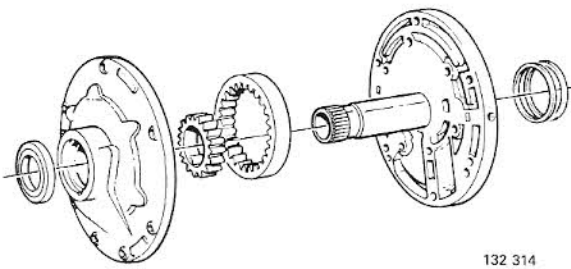


**Hydraulic system**

Means of controlling the mechanical power transmission system are required. This is provided by a hydraulic system.

The system consists of the following main components: **Hydraulic oil pump, centrifugal governor and control system** (valve system).

The control system is supplemented by three accumulator pistons which contribute to smoother gear shifting.

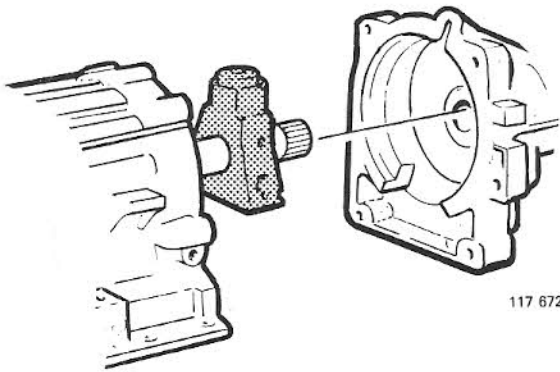


**Hydraulic oil pump**

The unit is a conventional gear pump which operates while the engine is running. The unit is driven by the torque converter.

Consisting basically of a split pump housing, drive gear and runner, the pump draws hydraulic fluid from the sump through a strainer and delivers it at a controlled pressure to the various gearbox components.

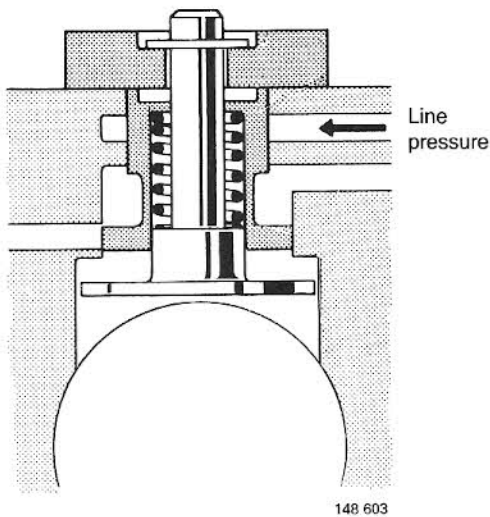
The controlled pressure is known as the **line pressure**.



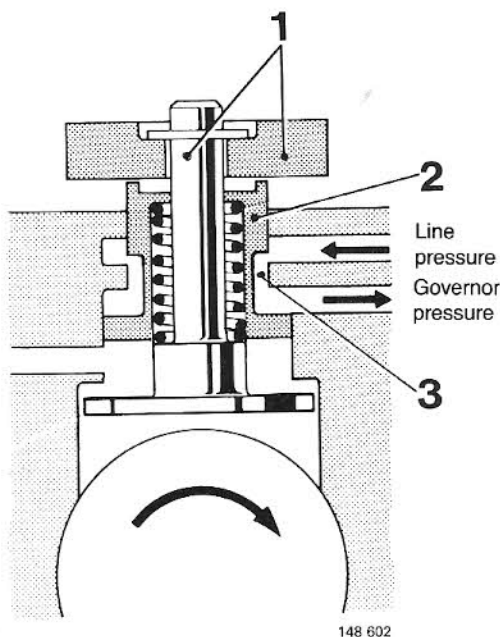
**Governor**

The governor is mounted on the output shaft and rotates at the same speed. Acting as a combined centrifugal valve and spring-loaded valve, the device converts the line pressure to a value which varies with the shaft speed or, in other words, with the speed of the car. This is known as the **governor pressure**. Oil is supplied to the governor through the gear selector valve (see under 'Control system' on page 19).

The variable governor pressure is supplied to the control system, in which it is used to operate the shift and down-shift functions.

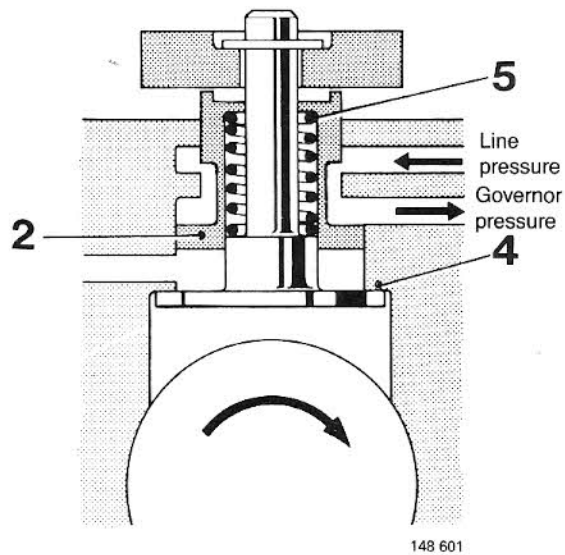


In this illustration, the governor is shown with the car and output shaft at rest. In this case, the line pressure outlet is blocked and the governor pressure is nil. Since the latter must be increased continuously in proportion to the speed of the car in order to perform the control system functions, the governor is designed to operate in two stages.



- A. The car is now moving slowly and the output shaft (governor) speed is low. As the governor rotates, the governor weight (1) and valve (2) move outwards under the action of centrifugal force, opening the valve, and line pressure is converted to governor pressure as oil flows through passage (3). The valve is maintained in equilibrium by the governor pressure.

Hydraulic system



B. As the speed of the car increases, the governor weight continues to move outwards until it is stopped by the housing (4). At this point, the governor pressure is controlled by the centrifugal force of the governor valve (2) and by a spring (5) behind the valve.

This makes the governor pressure less sensitive to variations in the speed of the output shaft.

The governor action thus consists of two distinct phases.

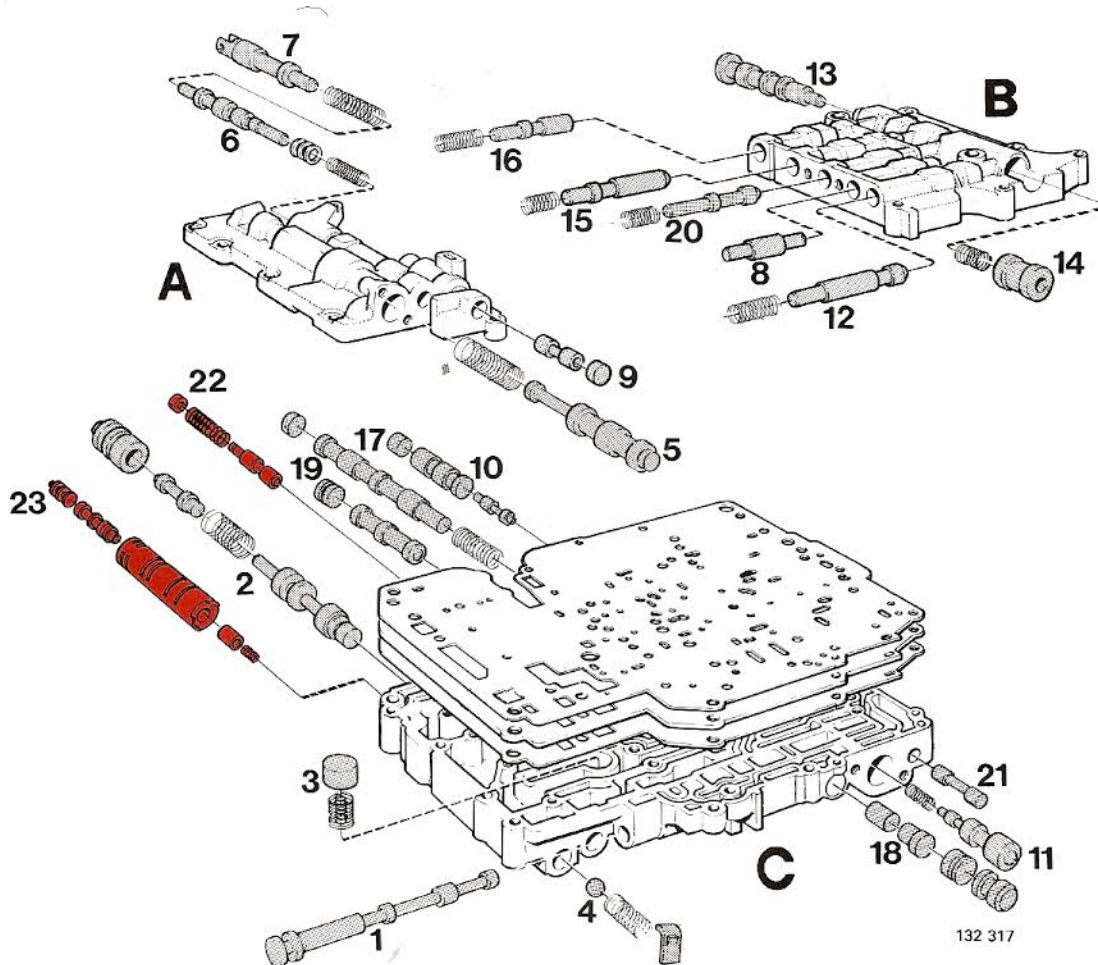
### Control system

The system controls the planetary drive assembly in the gearbox, ensuring that it operates in a gear appropriate to the throttle position, vehicle speed, terrain and gear position (as selected manually).

The hydraulic circuits are supplied at a constant line pressure which is converted and controlled so as to ensure that

the clutches and brakes are operated in the correct order. This is achieved by means of a number of hydraulic valves assembled in three valve bodies and forming a compact hydraulic unit.

The valve locations are illustrated below.



132 317

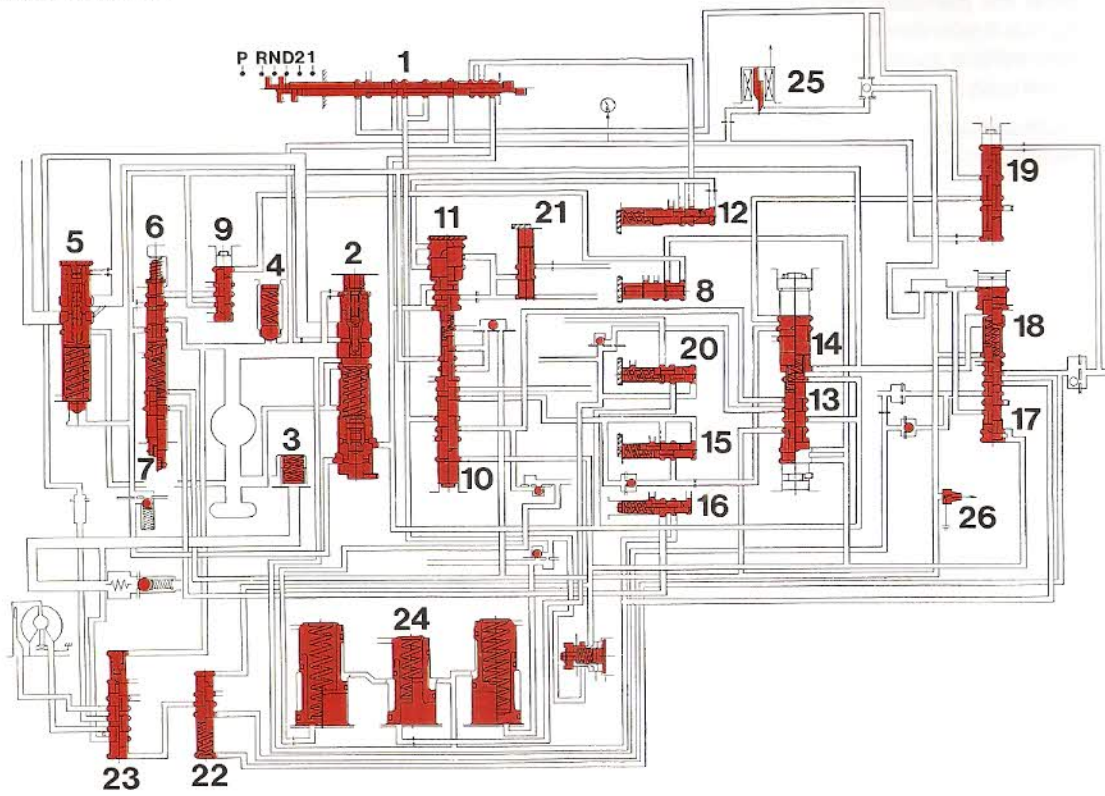


Gearboxes with lock-up function only

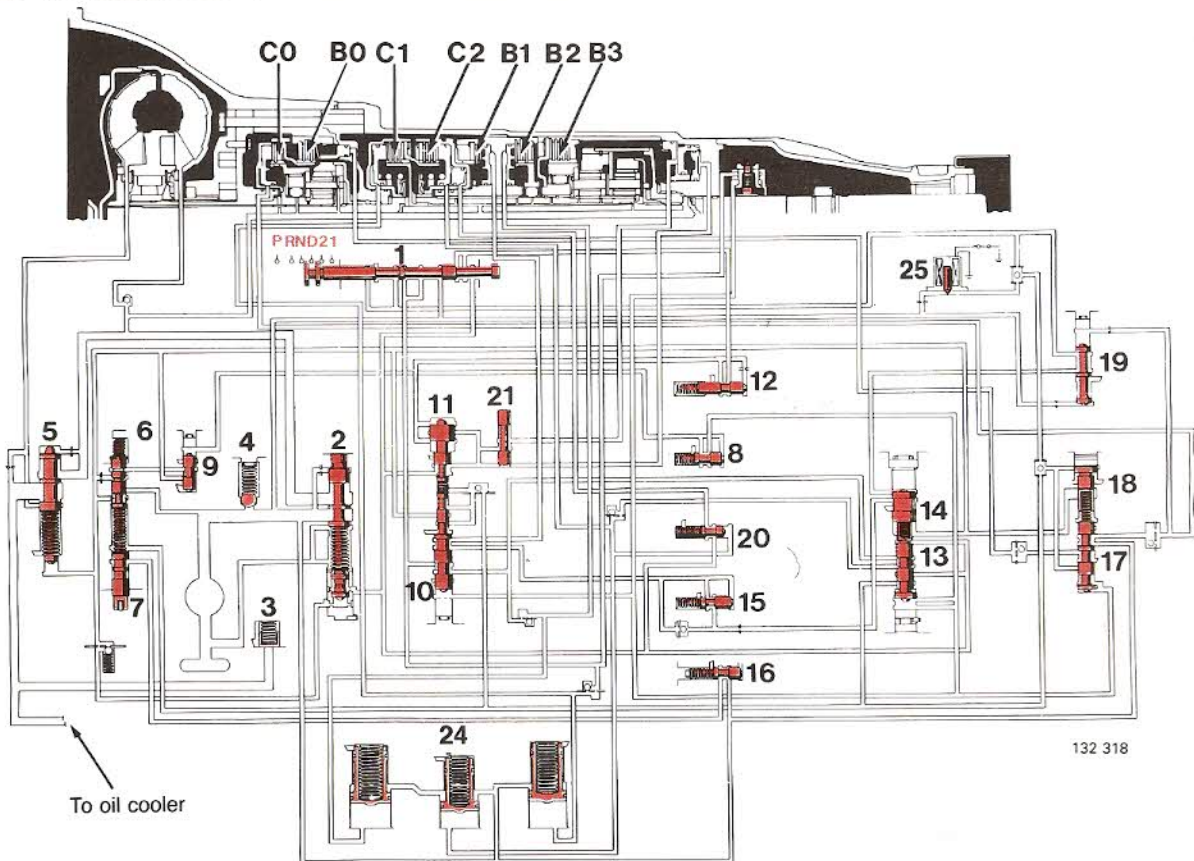
- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>A Upper front valve body</li> <li>B Upper rear valve body</li> <li>C Lower valve body</li> <li>1 Gear selector valve</li> <li>2 Primary regulator valve</li> <li>3 By-pass valve</li> <li>4 Relief valve</li> <li>5 Secondary regulator valve</li> <li>6 Throttle valve</li> <li>7 Kickdown valve</li> <li>8 Governor modulator valve (aluminium plug) (earlier AW 70/71s are fitted with steel valve and spring)</li> </ul> | <ul style="list-style-type: none"> <li>9 Cutback valve</li> <li>10 Shift valve 1-2</li> <li>11 Downshift valve, manual 2-1</li> <li>12 Modulator valve, manual 2-1</li> <li>13 Shift valve 2-3</li> <li>14 Downshift valve, manual 3-2</li> <li>15 Modulator valve, manual 3-2</li> <li>16 Detent regulator valve</li> <li>17 Shift valve 3-4</li> <li>18 Downshift valve, manual 4-3</li> <li>19 Regulator valve, downshift D-2, manual</li> <li>20 Control valve, rear clutch C2</li> <li>21 Control valve, rear brake B3</li> </ul> | <ul style="list-style-type: none"> <li>22 Signal valve (lock-up)</li> <li>23 Changeover valve (lock-up)</li> <li>24 Accumulator pistons C1, C2, B2</li> <li>25 Solenoid valve</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Control system

AW 71 L, AW 72 L with lock-up function (signal valve and changeover valve), and with oil pressure switch for kickdown inhibitor



AW 70/71 without lock-up function or kickdown inhibitor



132 318

**Gear selector valve (1)**

Operated directly by the gear selector mechanism, the valve determines the position (P, R, N, D, 3, 2, 1) in which the gearbox operates.

The valve is supplied with oil at line pressure and distributes it to the appropriate passages according to the position selected. The governor is also supplied from the gear selector valve.

The pressure used in the actual gear-shifting operation (i.e. to engage clutches and/or brakes) is low when the load on the gearbox is low, and vice versa.

**Primary regulator valve (2)**

The primary regulator valve modifies the line pressure to suit different operating conditions. For example, a higher pressure is required in the R position and when accelerating.

**By-pass valve (3)**

The by-pass valve protects the oil cooler from excessive pressure.

**Relief valve (4)**

Located immediately downstream of the oil pump, the relief valve opens if the line pressure becomes excessive.

**Secondary regulator valve (5)**

The main purpose of the secondary regulator valve is to control the torque converter pressure.

**Throttle valve (6)**

The throttle valve is supplied with oil at line pressure and converts it to throttle pressure, which varies with the amount of throttle. This, in turn, actuates the shift valves in combination with the governor pressure.

**Kickdown valve (7)**

The effect of the throttle pressure on the shift valves is amplified, by the opening of a special kickdown circuit, when the accelerator is pressed to the floor. Together with the normal throttle pressure, this boost from the kickdown valve means that shifting takes place at higher speeds than normal.

**Governor modulator valve (8)**

The valve operates the cutback valve (9). In later transmissions, in which the valve has been replaced by an aluminium plug, the governor pressure is supplied directly to the cutback valve.

**Cutback valve (9)**

The cutback valve is supplied with modulated governor pressure by governor modulator valve (8). However, in units in which valve (8) has been replaced by an aluminium plug, the governor pressure is supplied directly. The purpose of the valve is to reduce the throttle pressure and, as a result, the line pressure at normal and high speeds. The advantages include a reduction in the power required to drive the oil pump and improved quality of gear shifting.

**Shift valve 1-2 (10)**

The valve controls the engagement of 1st and 2nd gears.

Throttle pressure (which varies with the throttle opening) acts on one end of the valve and governor pressure (which varies with the speed of the car) on the other.

A port in the centre supplies fluid to the planetary drive brakes which control 1st and 2nd gears. The gear engaged depends on the manner in which the throttle pressure and governor pressure act on the valve.

**Downshift valve, manual 2-1 (11)**

When the gear selector lever is moved to position 1, one end of downshift valve 2-1 is supplied with a modulated line pressure. Shift valve 1-2 is thereby moved to its bottom position, preventing an upshift.

In the course of its travel, the downshift valve also opens a passage which admits line pressure to apply brake B3. (This affords engine braking in position 1.) If, on the other hand, the car is in 2nd gear when the selector is moved to position 1, downshifting to 1st will take place **only when the modulated line pressure is higher than the governor pressure in shift valve 1-2.**

**Modulator valve, manual 2-1 (12)**

Operative only when position 1 is selected, the valve performs two functions:

- It **reduces** the operating pressure (line pressure) to brake B3, affording gentler engine braking.
- Operating in combination with downshift valve 2-1, it performs downshifting from 2nd to 1st with the selector in position 1, while also preventing downshifting at an excessively high speed.

**Shift valve 2-3 (13)**

The valve controls the engagement of 2nd and 3rd gears.

Throttle pressure (which varies with the throttle opening) acts on one end of the valve and governor pressure (which varies with the speed of the car) on the other.

A port in the centre supplies fluid to the planetary train brakes controlling 2nd and 3rd gears. The gear engaged depends on the manner in which the throttle pressure and governor pressure actuate the valve.

**Downshift valve, manual 3-2 (14)**

Line pressure is supplied to one end of the valve when position 2 is selected, moving shift valve 2-3 to its bottom position and preventing an upshift to 3rd. If the car is in 3rd when position 2 is selected, downshifting to 2nd will take place regardless of the throttle opening or speed of the car.

**Downshift 4-2**

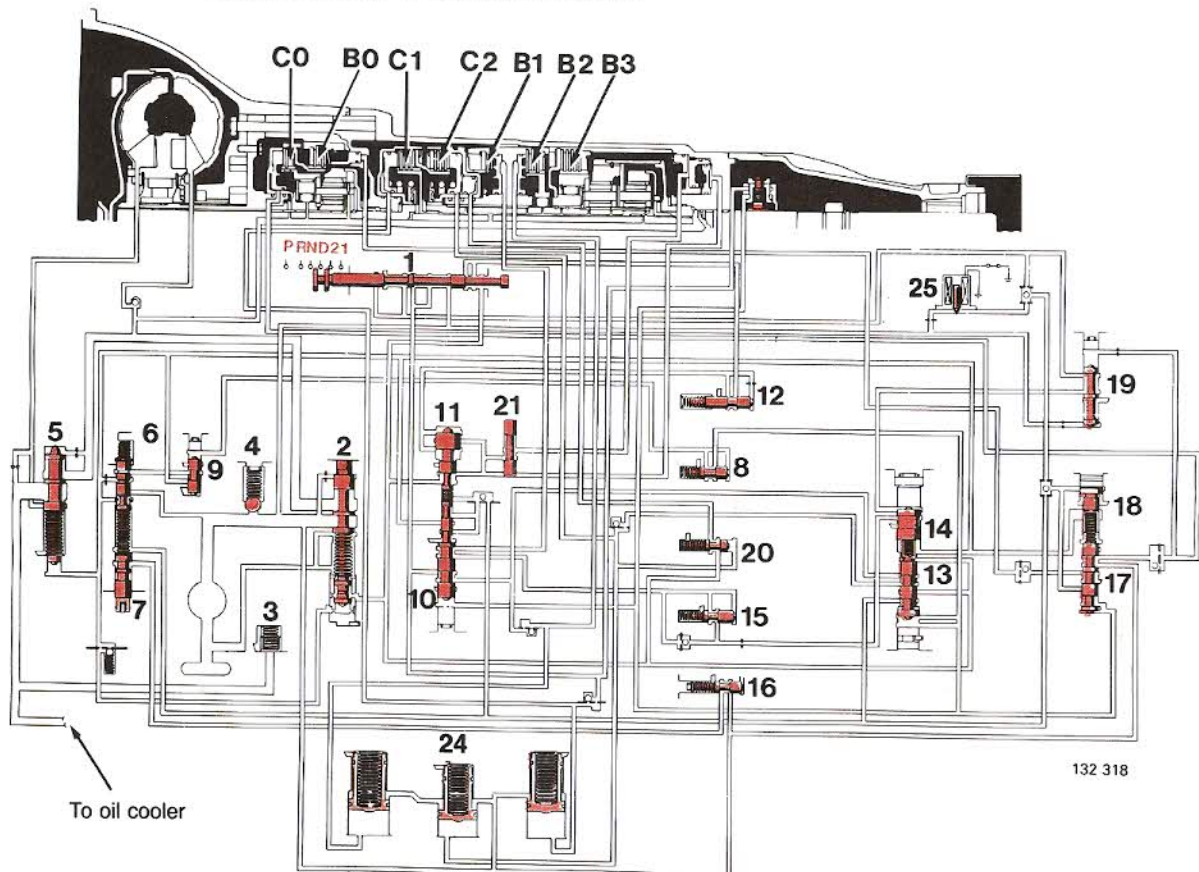
If 4th gear is engaged, a slightly delayed but barely noticeable downshift to 2nd will take place due to the special function of manual downshift control valve D-2. (See description of valve (19) below.)

Control system

AW 71 L and AW 72 L with lock-up function (signal valve and changeover valve), and with oil pressure switch for kickdown-inhibitor



AW 70/71 without lock-up function or kickdown inhibitor



**Modulator valve, manual 3-2 (15)**

The valve reduces the operating pressure to brake B1 for gentler engine braking in 2nd gear.

**Detent regulator valve (16)**

Located upstream of the kickdown valve, the detent regulator valve is supplied continuously with line pressure. In this position, it reduces the line pressure to a suitable circuit pressure which is then used by the kickdown valve to control the shift valves and downshift valve 4-3.

**Shift valve 3-4 (17)**

Throttle pressure (which varies with throttle opening) is supplied to one end of the valve and an opposing governor pressure (which varies with the speed of the car) to the other.

Line pressure is supplied to clutch C0 and brake B0 through two ports in the middle of the valve, the position of the valve (or, in effect, the balance between the governor and throttle pressures) determining which is pressurized.

**Downshift valve, manual 4-3 (18)**

The valve is either operated manually by the switch on the gear selector lever or automatically by the kickdown function.

Under these conditions, the valve is supplied with system pressure or kickdown pressure, as appropriate, at one end.

In manual operation (by means of the solenoid valve), the downshift valve moves shift valve 3-4 to its bottom position (i.e. 4th gear is disengaged). The downshift valve remains in this position until the solenoid valve is deenergized.

In a kickdown shift, on the other hand, the valve is held in the bottom position only as long as the kickdown pressure is greater than the governor pressure. The latter acts in opposition to the kickdown pressure through shift valve 3-4.

**Downshift D-2 control valve, manual (19)**

The valve controls the point at which 2nd gear is engaged when downshifting manually from position D to position 2, ensuring that this takes place in stages from 4th to 3rd and then to 2nd.

Line pressure (throttled) acts on one end of the valve and the operating pressure for clutch C0 on the other.

A port in the middle of the valve controls the flow of fluid to downshift valve 3-2.

The flow to downshift valve 3-2 is a function of the balance between the line pressure and clutch C0 operating pressure on the valve spool.

**Control valve, rear clutch, reverse (20)**

Clutch C2 is provided with two piston surfaces. While the smaller surface is sufficient to enter reverse when 3rd gear is engaged, both must be used to prevent the clutch from slipping when in position R. The function of the control valve is to ensure gentle engagement of reverse by application of the rear clutch in stages.

**Control valve, rear brake, reverse (21)**

The function of the valve is to ensure gentle engagement of reverse. This is achieved by application of brake B3 in stages. The brake is equipped with two hydraulic pistons, each with individual ports.

Consisting essentially of a restriction in the supply to the pistons, the valve distributes the oil flow between the ports. Since the front piston receives a higher flow than the rear piston, it receives full operating pressure before the latter, prolonging the operation of B3.

**Lock-up signal valve (22)**

Line pressure is supplied to one end of the valve and governor pressure to the other. Two line pressure inlets are provided, one for selector positions 1-3 and one for selector position 4. When 4th gear is engaged and the governor pressure (i.e. the speed of the car) increases, oil flows at line pressure from the control valve to the changeover valve (23).

**Lock-up changeover valve (23)**

The valve is actuated by oil at line pressure from the signal valve. Opening of the valve reverses the fluid flow from the torque converter, operating the lock-up clutch plate and activating the lock-up function.

**Accumulator pistons (3 off) (24)**

Each of the circuits serving the front clutch, rear clutch and brake B2 incorporates an accumulator piston.

The pistons are installed in parallel with the C1, C2 and B2 circuits.

When supplying operating pressure to B2, for example, the fluid flow is divided between the brake piston and the accumulator piston. As a result, braking takes place gently when the brake is first applied and full operating pressure is developed only when the accumulator piston is full. This ensures a smooth increase in operating pressure, resulting in gentler shifting.

**Solenoid valve (25)**

Disengagement of 4th gear (overdrive) is controlled by the solenoid valve. Disengagement is performed manually using the switch on the gear selector lever.

When the switch is operated, the solenoid valve (which is supplied at constant line pressure) relieves the pressure to downshift valve 4-3, moving shift valve 3-4 to its bottom position and disengaging overdrive.

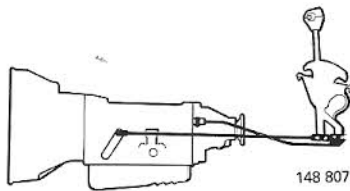
The valve does not return to its idle position until another signal is received from the switch on the gear selector or the ignition is switched off. (See also under 'Electrical system for manual engagement and disengagement of 4th gear' on page 25.)

**Oil pressure switch, kickdown inhibitor (26)**

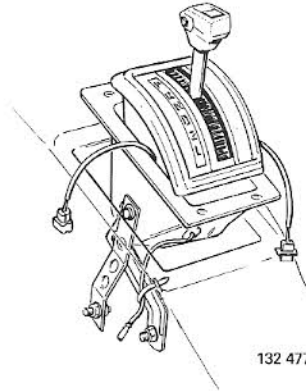
(Europe only)

The oil pressure switch is actuated by the throttle/kickdown pressure. The signals supplied by the switch to the overdrive relay are delivered to the solenoid valve (25), which operates downshift valve 4-3 (18). In this manner, the pressure switch indirectly controls downshifting from 4th to 3rd. See also under 'Kickdown inhibitor' on page 27.

Gear selector mechanism



148 807



132 477

## Gear selector mechanism

Mounted on the propeller shaft tunnel, the gear selector mechanism is operated by a lever which is locked in certain positions. A release button on the lever must be pressed to select positions other than these.

The selector positions are P, R, N, D, 2 and 1.

Both the selector lever and ratchet plate are pivot-mounted in the selector housing, which is bolted to the body.

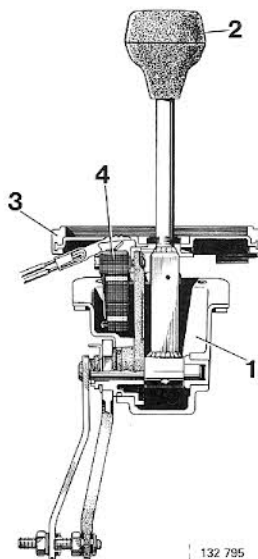
Since the lever and plate are also connected to the gearbox by the selector linkage, the mechanism follows the movements of the gearbox. The main components of the mechanism are:

- 1 **Selector housing** bolted to body
- 2 **Gear selector lever** attached to selector link on gearbox by a control rod
- 3 **Ratchet plate** attached to gearbox housing by a reaction arm and strut linkage.

The mechanism incorporates a two-function switch (4) incorporating:

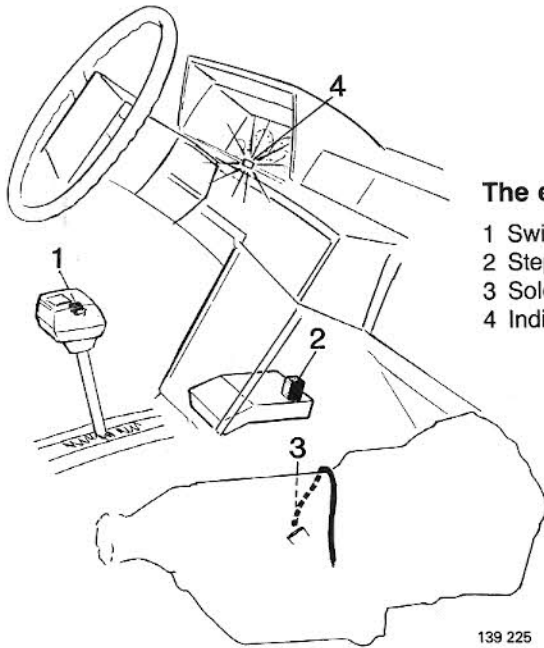
- start-inhibitor contacts ensuring that the engine can be started only in positions P and N
- reversing light contacts operated in position R

The gear selector knob is also provided with a switch for engaging and disengaging 4th gear.



132 795

### Electrical system for manual engagement and disengagement of 4th gear

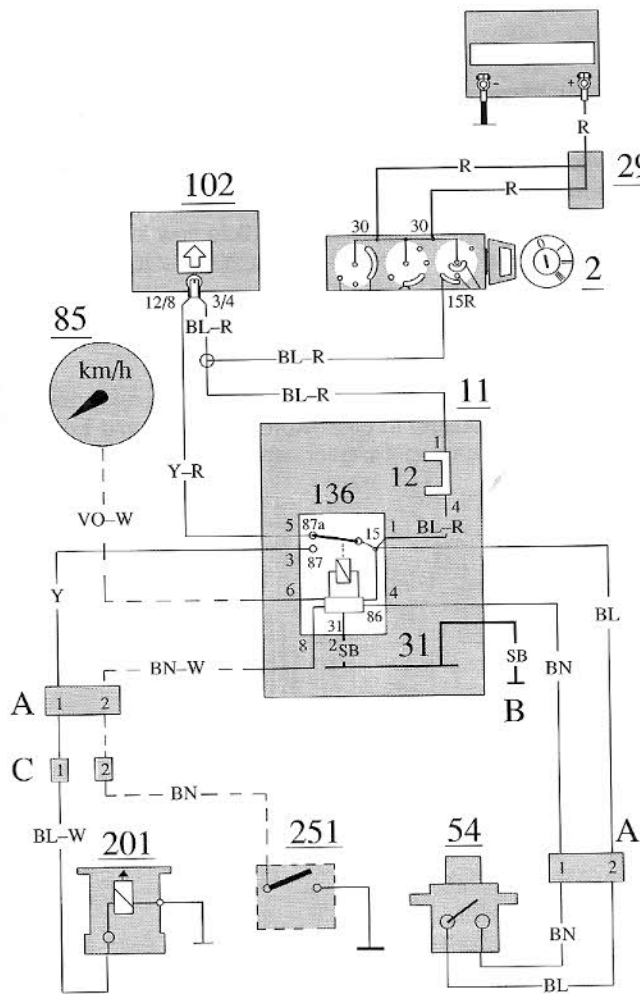


The electrical system consists of the following components:

- 1 Switch on gear lever knob (54)
- 2 Stepping relay in electrical distribution unit (136)
- 3 Solenoid valve in transmission (201)
- 4 Indicating lamp on combined instrument (102)

139 225

### Complete wiring diagram

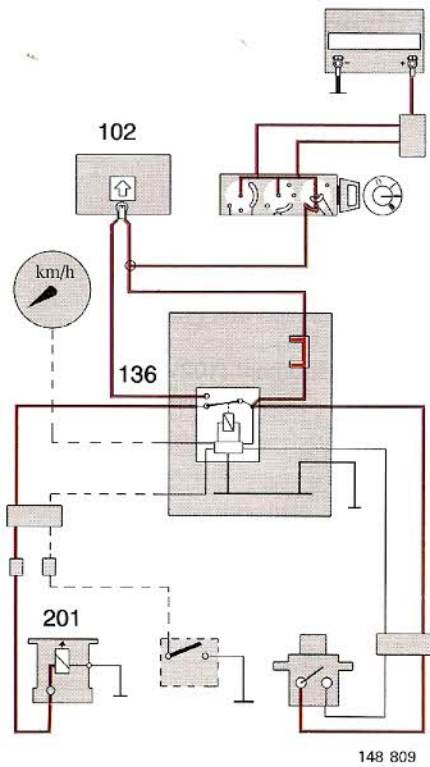


- 1 Battery
- 2 Ignition switch
- 11 Fusebox
- Instrument connection
- 29 Positive terminal board
- 31 Ground
- 54 Switch on gear lever knob
- 85 Speedometer signal
- 102 Indicating lamp, OD off
- 136 Stepping relay
- 201 Solenoid valve in transmission
- 251 Kickdown inhibitor (oil pressure switch)

- A Connector
- B Ground, right A-post
- C Connector

148 808

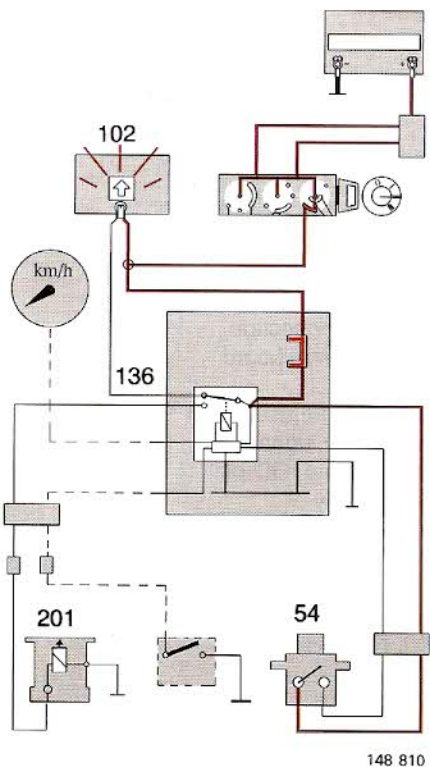
Gear selector mechanism



**4th gear engaged**

When 4th gear is engaged (the normal situation), solenoid valve 201 is energized by stepping relay 136.

The solenoid valve controls the fluid flow in the control system so that 4th gear is engaged and indicating lamp 102 is extinguished.



**Disengagement of 4th gear**

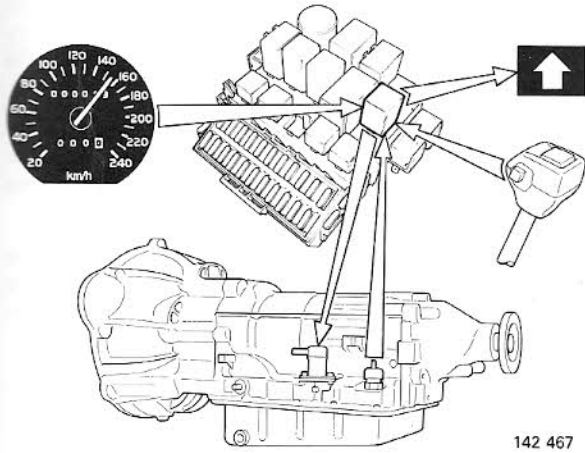
The stepping relay deenergizes the solenoid valve when switch 54 on the gear lever knob is depressed, supplying current instead to indicating lamp 102.

The solenoid valve now alters the fluid flow in the control system to produce a downshift from 4th gear to direct drive (3rd).

Fourth gear remains disengaged until the switch is again operated.

When the ignition is switched off, the stepping relay reverts to its normal status. In other words, the solenoid valve is energized, engaging 4th gear, when the ignition is again switched on.

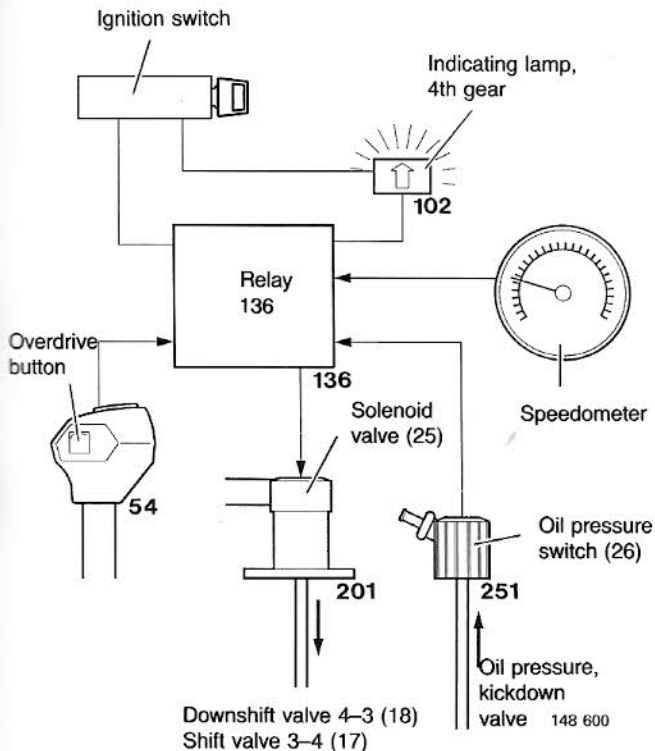
### Kickdown inhibitor



#### General

Transmissions with the kickdown inhibitor include the AW 71 L combined with the B 230 FT engine (Europe), the AW 71 with the B 280 E and B 280 F (excl. USA/Canada) and the AW 72 L (excl. USA/Canada). The kickdown inhibitor has two functions, both of which are designed to avoid overrunning of the engine:

- A shift from 3rd to 4th takes place even if the accelerator is held in the kickdown position when accelerating to an extremely high speed.
- Downshifting to 3rd is prevented above a certain speed even if the accelerator is pressed to the kickdown position.



The kickdown inhibitor is controlled by signals from the speedometer and from an oil pressure switch (26) which, in turn, is actuated by the throttle pressure/kickdown pressure in the control system. The signals are fed to the solenoid valve (25) via the relay and then to downshift valve 4-3 (18). See also hydraulic circuit diagrams on pages 20-23.

*Kickdown inhibitor*

**Principle of operation**

The control system prevents the downshift valve from downshifting from 4th to 3rd at speeds above 120 km/h. However, this may be overridden in the kickdown position with the aid of the kickdown inhibitor, permitting a shift to take place up to approx. 160 km/h.

**60–120 km/h (37–100 mph):** Under normal driving conditions, the shift valve controls the shifting speed, which may vary depending on the throttle opening (throttle pressure).

**60–160 km/h (37–74 mph) + kickdown:** At full throttle, the throttle pressure becomes kickdown pressure, enabling the oil pressure switch on the gearbox to operate the overdrive relay. If the speed is below 160 km/h, the relay will close the solenoid valve which actuates downshift valve 4–3, permitting a downshift even if the speed exceeds 120 km/h.

**Above 160 km/h (100 mph):** At approx. 160 km/h, the relay is operated by the signal from the speedometer. The solenoid valve is energized and upshifting takes place.

If the accelerator is inadvertently moved to the kickdown position at a speed above 160 km/h, downshifting will occur since the speed at which this is performed by the downshift valve is exceeded, while the relay is blocked by the speedometer signal and cannot actuate the solenoid valve.

To avoid unnecessary solenoid valve wear, it is not operated by the relay at low speeds (below approx. 80 km/h = 50 mph) at which the kickdown function is activated by the downshift valve.

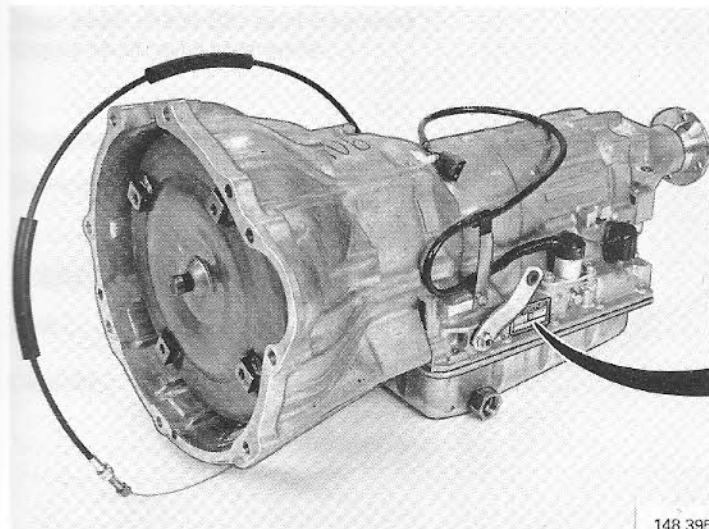
Neither the shift/downshift function (performed with the button on the gear selector lever) nor the operation of the indicating lamp is affected by the speed or kickdown pressure. These function in the same manner as before.

# Specifications

## Contents

	Page
<b>Identification of transmission</b> .....	29
<b>Specifications, planetary gearbox</b>	
Reduction ratios, gearbox .....	31
Torque converter ratios .....	31
Clearances .....	31
Solenoid valve .....	31
Transmission fluid .....	31
Transmission by model and engine type .....	32
Shift conditions at kickdown .....	33
Torque converter, stall speed, torque converter housing .....	34
Drive flange, solenoid valve, kickdown inhibitor, oil sump .....	35
Kickdown cable, throttle cam, governor .....	36
Line pressures .....	37
Stall speed pressures .....	38
Governor pressures .....	39
<b>Specifications, control system</b>	
Replacement schedule, control system .....	40
Springs .....	41
Valve spring specifications .....	42
Accumulator pistons and accumulator springs .....	43
Separator plate, cover plate, lower valve body .....	44
<b>Torques</b> .....	45

## Identification of transmission



148 396

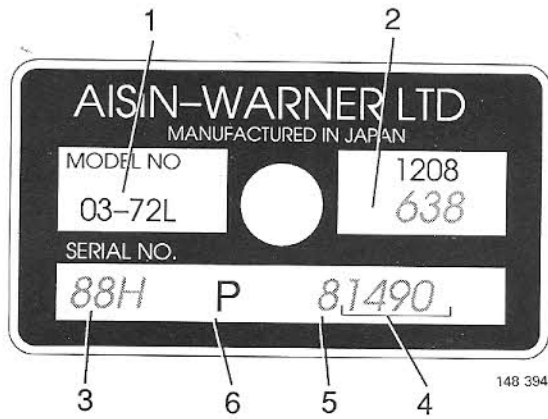
148 395

This manual deals with the design, function and repair of the following automatic transmissions installed in models from 1982 on:

- AW 70
- AW 70 L (L indicates that unit is equipped with lock-up function)
- AW 71
- AW 71 L (L indicates that unit is equipped with lock-up function)
- AW 72 L (transmission available only with lock-up function)

The transmission is identified from the product plate on the left-hand side of the unit.

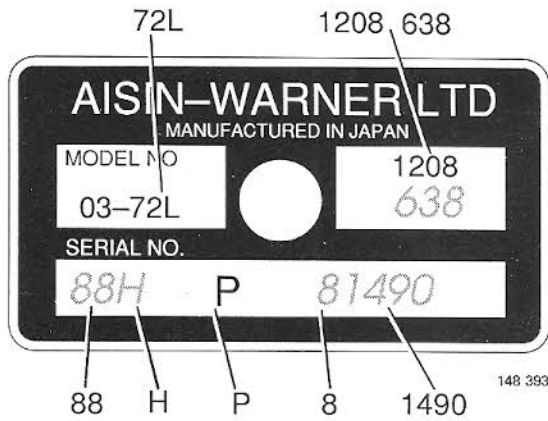
Identification of transmission



**Identification**

The product plate on the unit specifies:

1. Type designation
2. Volvo part number
3. Year and month of manufacture
4. Serial number (four-digit)
5. Figure 8 indicates that transmission has been manufactured for Volvo
6. Transmission type code



**Example:**

- 72L** – AW 72L
- 1208638** – Volvo part number (as from 1983)
- 88** – Manufactured in 1988
- H** – Manufactured in August (A = January, B = February ... M = December. I is not used)
- P** – AW 72 L (C = AW 70, K = AW 70 L, F = AW 71 and H = AW 71 L)
- 8** – Transmission manufactured for Volvo
- 1490** – Aisin-Warner serial number (commences with 0001 each month)

## Specifications

### Reduction ratios, gearbox

	AW 70/71	AW 72 L
Reduction ratio, 1st gear .....	2.45:1	2.83:1
2nd gear .....	1.45:1	1.49:1
3rd gear .....	1.1	1.1
4th gear .....	0.69:1	0.73:1
Reverse .....	2.21:1	2.21:1

### Torque converter ratios

Type mm	Ratio	Size/dia.,
177 K, available only without lock-up .....	1.85:1	248
190 K, without lock-up .....	1.80:1	248
190 K, with lock-up .....	1.72:1 (AW 70 L)	254
190 K, with lock-up .....	1.72:1 (AW 71 L)	254
217 K, without lock-up .....	2.10:1	248
206 K, with lock-up .....	1.80:1 (AW 71 L)	254
206 K, with lock-up, new type for B 234 F only .....	2.40:1 (AW 72 L)	254

### Clearances

	AW 70/71/72 L
Oil pump: Pump housing – ring gear (runner) .....	0.07–0.15 mm
arc segment – ring gear .....	0.11–0.14 mm
axial clearance .....	0.02–0.05 mm
Brake B0: Clearance between clutch pressure plate and retaining ring .....	0.35–1.60 mm
Clutch C2, brakes B1 and B2: Clearance between clutch pressure plate and retaining ring .....	0.3–1.2 mm
Input shaft, clutch C0, axial clearance .....	0.3–0.9 mm
Output shaft, axial clearance .....	0.3–0.9 mm

### Solenoid valve

Resistance .....	13 ohm
------------------	--------

### Transmission fluid

Type .....	Models to 1983 inclusive: ATF, type F Models from 1984 on: ATF, type Dexron II D
Capacity .....	7.5 l (approx. 2.5 l in torque converter)

**Transmission by model year and engine type**

Model year	Engine	Transmission	Volvo P/N
1990–	B 230 FT (Eur) <sup>1)</sup>	AW 71 L	1208643
1990–	B 230 FT (USA)	AW 71	1208642
1989–	B 234 F (USA)	AW 72 L	1208666
1989–	B 234 F (Eur)	AW 72 L	1208667
1989–	B 230 FT	AW 71	1208661
1989–	B 200 F (Fi)	AW 70	1208659
1989–	B 230 F (Eur)	AW 70 L	1208652
1989–	B 234 F (Eur)	AW 72 L	1208638
1989–	B 234 F (USA)	AW 72 L	1208637
1989–	B 230 F <sup>2)</sup>	AW 70 L	1208604
1987–	B 230 F (USA)	AW 70 L	1208563
1987–	B 280 E (Eur)	AW 71	1208534

<sup>1)</sup> New turbocharger unit from 1990 on

<sup>2)</sup> USA, Canada, Japan, Australia

Model year	Engine	Transmission	Volvo P/N
1987–	B 280 E (No)	AW 71	1208533
1987–	B 280 F	AW 71	1208532
1986–1987	B 230 K	AW 71 L	1208417
1985–1986	B 200 E	AW 70	1208415
1985–1987	B 230 K	AW 71 L	1208371
1985–1987	B 28 A	AW 71	1208360
1984–	B 23/B 230 FT	AW 71	1208334
1985–1987	B 19/B 200 K	AW 70	1208332
1984–1985	B 19 E	AW 70	1208314
1982–1987	B 28 E	AW 71	1208310
1985–1987	B 230 A	AW 71	1208304
1984–1985	B 23 E	AW 71	1208300
1983–1987	B 28 F	AW 71	1208248

## Shift conditions at kickdown

Transmission Volvo P/N		Speed (r/min)			Speed, full-throttle shift (km/h)			Max speed for kickdown (km/h)			Lock-up in-out ratio (km/h)	Final drive ratio
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	3 <sup>rd</sup>	2 <sup>nd</sup>		
AW 71 L	1208643	5400	5600	5000	64	116	155	150	108	48	98/96	3.73
AW 71	1208642	5400	5600		64	116			108	48	—	3.73
AW 72 L	1208666	5800	5800		56	102			93	41	86/84	4.10
AW 72 L	1208667	5800	5800	5600	56	102	155	150	93	41	86/84	4.10
AW 71	1208661	5400	5600		63	105			99	50	—	3.73
AW 70	1208659	5400	5600		57	101			94	46	—	4.10
AW 70 L	1208652	5200	5400		57	99			93	45	86/84	4.10
AW 72 L	1208638	5800	5800	5600	56	102	155	150	93	41	86/84	4.10
AW 72 L	1208637	5800	5800		56	102			93	41	86/84	4.10
AW 70 L	1208604	5200	5400		57	99			93	45	77/73	4.10
AW 70 L	1208563	5200	5400		63	106			100	52	78/76	4.10
AW 71	1208534	5300	5500	5600	60	105	162	157	99	49	—	3.91
AW 71	1208533	5300	5500	5600	60	105	162	157	99	49	—	3.91
AW 71	1208532	5300	5500		63	110			104	51	—	3.73
AW 71 L	1208417	5200	5400		66	111			105	55	85/83	3.91
AW 70	1208415	5200	5400		67	113			107	55	—	3.91
AW 71 L	1208371	5200	5400		66	111			105	55	85/83	3.91
AW 71	1208360	5200	5400		73	123			115	58	—	3.54
AW 71	1208334	5400	5600		63	105			99	50	—	3.73
AW 70	1208332	5200	5400		67	113			107	55	—	4.10
AW 70	1208314	5200	5400		62	103			97	49	—	3.91
AW 71	1208310	5400	5600		67	112			106	53	—	3.54
AW 71	1208304	5200	5400		71	119			111	56	—	3.73
AW 71	1208300	5400	5600		63	105			99	50	—	3.73
AW 71	1208248	5400	5600		67	112			106	53	—	3.54

**Torque converter, stall speed, torque converter housing**

		Torque converter								Stall speed	Torque converter housing						
		1239685	1239686	1239882	1239940	3520962	3502496	1340122	1340134		6814907	speed (r/min)	1239688	1239687	1340052	1340133	1239977
		6 CYL. 248 mm 177K	4 CYL. 248 mm 190K	4 CYL. 248 mm 217K	4 CYL. 254 mm 206K	4 CYL. 254 mm 190K*	4 CYL. 254 mm 190K	4 CYL. 248 mm 217K*	6 CYL. 248 mm 177K			4 CYL.	6 CYL.	4 CYL. With timing pick-up	6 CYL. With timing pick-up	4 CYL.	4 CYL. With timing pick-up
<b>Transmission Volvo P/N</b>																	
AW 71 L	1208643					•				2000–2700							•
AW 71	1208642	•								2000–2700			•				
AW 72 L	1208666									• 2500							•
AW 72 L	1208667									• 2500							•
AW 71	1208661	•								2000–2700	•						
AW 70	1208659		•							2200			•				
AW 70 L	1208652						•			2000							•
AW 72 L	1208638									• 2400							•
AW 72 L	1208637									• 2400							•
AW 70 L	1208604							•		2000							•
AW 70 L	1208563							•		2000						•	
AW 71	1208534									• 2100				•			
AW 71	1208533									• 2100				•			
AW 71	1208532									• 2100				•			
AW 71 L	1208417				•					2520							•
AW 70	1208415			•						2100	•						
AW 71 L	1208371				•					2520							•
AW 71	1208360	•								2100		•					
AW 71	1208334		•							2000–2700	•						
AW 70	1208332			•						2300			•				
AW 70	1208314			•							•						
AW 71	1208310	•								2100		•					
AW 71	1208304			•						2100	•						
AW 71	1208300		•							2100	•						
AW 71	1208248	•								2000		•					

\* Torque converter with mounting lugs

Drive flange, solenoid valve, kickdown inhibitor, oil pump

		Drive- flange valve		Solenoid valve		Kick- down inhi- bitor		Cool- ing con- nec- tions		Oil sump	
Transmission Volvo P/N		1233406 1100 (stepped)	1233402 1300 (slotted)	1239680 6 CYL. (white)	1239928 4 CYL. (red)	3502079 6 CYL.		1239699 front, slope 13.5 deg.	1239699 rear, slope 13.5 deg.	1233333 without drain plug	1233415 with drain plug
AW 71 L	1208643		•		•		•	•	•		•
AW 71	1208642		•		•			•	•		•
AW 72 L	1208666		•		•			•	•		•
AW 72 L	1208667		•		•		•	•	•		•
AW 71	1208661		•		•			•	•		•
AW 70	1208659		•		•			•	•		•
AW 70 L	1208652		•		•			•	•		•
AW 72 L	1208638		•		•		•	•	•		•
AW 72 L	1208637		•		•			•	•		•
AW 70 L	1208604		•		•			•	•		•
AW 70 L	1208563		•		•			•	•		•
AW 71	1208534		•			•	•	•	•		•
AW 71	1208533		•			•	•	•	•		•
AW 71	1208532		•	•				•	•		•
AW 71 L	1208417		•		•			•	•		•
AW 70	1208415		•		•			•	•		•
AW 71 L	1208371		•		•			•	•		•
AW 71	1208360		•	•				•	•		•
AW 71	1208334		•		•			•	•		•
AW 70	1208332		•		•			•	•		•
AW 70	1208314	•			•			•	•		•
AW 71	1208310		•	•				•	•		•
AW 71	1208304		•		•			•	•		•
AW 71	1208300		•		•			•	•	•	
AW 71	1208248		•	•				•	•		•

**Kickdown cable, throttle cam, governor**

Length of cable projecting into engine compartment with cable attached to transmission	Kickdown cable								Throttle cam	Governor							
	980/79	900/115	1072/79	770/76	770/76	900/179	590/177	900/130			900/99						
Length, cable sleeve	Y/P	Y/Y	Y/W	Y/W/BL	Y/W/P	Y/W/Y	Y/R/W	Y/R/R	Y/R/BL								
Marking, kickdown cable	1239930	1239932	1239933	1239934	1340044	1340048	1377680	3502073	3520189	1340027	1340031	1340033	3520200	1239785	1239867	3502454	6814940
Volvo P/N, kickdown cable	Transmission Volvo P/N																
AW 71 L 1208643		•											•			•	
AW 71 1208642		•											•			•	
AW 72 L 1208666									•				•				•
AW 72 L 1208667									•				•				•
AW 71 1208661		•								•						•	
AW 70 1208659		•										•		•			
AW 70 L 1208652		•										•		•			
AW 72 L 1208638								•				•					•
AW 72 L 1208637								•				•					•
AW 70 L 1208604		•										•		•			
AW 70 L 1208563		•										•		•			
AW 71 1208534							•					•				•	
AW 71 1208533							•					•				•	
AW 71 1208532							•					•				•	
AW 71 L 1208417						•					•			•			
AW 70 1208415	•											•		•			
AW 71 L 1208371						•					•			•			
AW 71 1208360				•							•			•			
AW 71 1208334		•							•					•			
AW 70 1208332						•					•			•			
AW 70 1208314	•											•		•			
AW 71 1208310			•									•		•			
AW 71 1208304				•							•			•			
AW 71 1208300	•											•		•			
AW 71 1208248			• <sup>1</sup>									•		•			

<sup>1</sup> 1233359 to March 1982 incl.

## Line pressure in gear positions D and R

Transmission Volvo P/N		Line pressure at idling – position D				Line pressure at idling – position R			
		MPa				MPa			
		0.35–0.44*	0.46–0.54**	0.44–0.52	0.51	0.50–0.64	0.70–0.82	0.64–0.76	0.77
AW 71 L	1208643		•				•		
AW 71	1208642		•				•		
AW 72 L	1208666			•				•	
AW 72 L	1208667			•				•	
AW 71	1208661		•				•		
AW 70	1208659	•				•			
AW 70 L	1208652		•				•		
AW 72 L	1208638		•				•		
AW 72 L	1208637		•				•		
AW 70 L	1208604		•				•		
AW 70 L	1208563		•				•		
AW 71	1208534				•				•
AW 71	1208533				•				•
AW 71	1208532				•				•
AW 71 L	1208417		•				•		
AW 70	1208415	•				•			
AW 71 L	1208371		•				•		
AW 71	1208360		•				•		
AW 71	1208334		•				•		
AW 70	1208332		•				•		
AW 70	1208314	•				•			
AW 71	1208310		•				•		
AW 71	1208304		•				•		
AW 71	1208300	•				•			
AW 71	1208248		•				•		

\* Red primary regulator valve, spring 0.38 MPa

\*\* White primary regulator valve, spring 0.47 MPa

**Stall speed pressure in gear positions D and R**

		Line pressure at idling – position D			Line pressure at idling – position R			
		MPa			MPa			
Transmission Volvo P/N		1.00–1.20	1.12–1.32	1.15	1.37–1.70	1.50–1.90	1.55–1.95	1.74
AW 71 L	1208643	•				•		
AW 71	1208642	•				•		
AW 72 L	1208666		•				•	
AW 72 L	1208667		•				•	
AW 71	1208661	•				•		
AW 70	1208659	•			•			
AW 70 L	1208652	•				•		
AW 72 L	1208638		•				•	
AW 72 L	1208637		•				•	
AW 70 L	1208604	•				•		
AW 70 L	1208563	•				•		
AW 71	1208534			•				•
AW 71	1208533			•				•
AW 71	1208532			•				•
AW 71 L	1208417	•				•		
AW 70	1208415	•			•			
AW 71 L	1208371	•				•		
AW 71	1208360	•				•		
AW 71	1208334	•				•		
AW 70	1208332	•				•		
AW 70	1208314	•			•			
AW 71	1208310	•				•		
AW 71	1208304	•				•		
AW 71	1208300	•			•			
AW 71	1208248	•				•		

**Governor pressures**

Final drive ratio							
3.54:1		3.73:1		3.91:1		4.10:1	
Speed	Pressure	Speed	Pressure	Speed	Pressure	Speed	Pressure
21 mph (34 km/h)	0.11–0.17 MPa	19 mph	0.09–0.15 MPa	18 mph	0.09–0.15 MPa	17 mph 16 mph	0.09–0.15 MPa
34 mph (55 km/h)	0.17–0.23 MPa	34 mph	0.16–0.22 MPa	33 mph	0.16–0.22 MPa	45 mph 28 mph	0.16–0.22 MPa
68 mph (110 km/h)	0.38–0.50 MPa	42 mph	0.41–0.53 MPa	64 mph	0.41–0.53 MPa	61 mph 59 mph	0.41–0.53 MPa

\* Applies to AW 72 L.



**Springs**

Transmission Volvo P/N		Valve springs			Return springs				Springs, signal valve		Governor springs										
		1239797 Shift valve 3-4	1239869 " "	1340126 " "	1239565 Detent regulator valve (green)	1239653 " (orange)	1239649 Modulator valve (light blue)	1239812 " (green)	B0	B2	C1	C2	3502499 (purple)	1340061 (light blue)	3502918	6814894 (green)	1239785 (locked by screw)	1239867 B-67220	3502454	6814938 <sup>1)</sup>	6814939 <sup>1)</sup>
AW 71 L	1208643	•			•		•					•	•						•		
AW 71	1208642	•			•		•					•	•						•		
AW 72 L	1208666		•									•	•							•	•
AW 72 L	1208667		•									•	•							•	•
AW 71	1208661	•			•		•					•	•						•		
AW 70	1208659		•		•	•			•			•	•						•		
AW 70 L	1208652		•		•		•					•	•						•		
AW 72 L	1208638		•				•													•	•
AW 72 L	1208637		•				•													•	•
AW 70 L	1208604		•		•		•					•	•						•		
AW 70 L	1208563		•		•		•					•	•						•		
AW 71	1208534			•	•		•					•	•						•		
AW 71	1208533		•		•		•					•	•						•		
AW 71	1208532		•		•		•					•	•						•		
AW 71 L	1208417			•	•		•					•	•						•		
AW 70	1208415		•		•	•			•			•	•						•		
AW 71 L	1208371			•	•		•					•	•						•		
AW 71	1208360	•			•		•					•	•						•		
AW 71	1208334	•			•		•					•	•						•		
AW 70	1208332		•		•	•			•			•	•						•		
AW 70	1208314		•		•	•			•			•	•						•		
AW 71	1208310	•			•		•					•	•						•		
AW 71	1208304	•			•		•					•	•						•		
AW 71	1208300	•			•		•					•	•						•		
AW 71	1208248	•			•		•					•	•						•		

<sup>1)</sup> Double springs in AW 72 L

## Valve spring specifications

Spring for	Designation in manual	Free length (mm)	Active turns	Wire dia. (mm)	Outside dia. (mm)	Remarks
Accumulator B2	<b>B2</b>	66.7	14.0	2.8	17.3	AW 70 (1208820, 284) AW 70 (1208320) AW 71
		68.3	13.0	2.6	17.9	
		66.7	12.0	3.2	20.4	
Accumulator C2	<b>C2</b>	61.2	11.5	2.5	16.5	AW 70 AW 71 AW 72 L, orange <sup>2)</sup> AW 72 L, blue <sup>2)</sup> AW 70, AW 71 AW 70 (1208320)
		55.2	8.5	2.0	15.9	
		32.2	6.5	1.6	14.7	
		43.6	9.5	1.8	14.3	
		68.6	15.5	2.0	17.5	
Accumulator C1	<b>C1</b>	64.8	13.0	2.0	17.2	
Governor valve	—	20.6	1.5	0.9	9.1	
Kickdown valve	<b>1A</b>	21.9	8.0	0.7	8.6	
Throttle valve	<b>2A</b>	43.0	15.5	1.2	10.9	
Detent regulator valve	<b>6B</b>	31.4	13.5	0.9	8.9	
Modulator valve, manual 3-2						
type 1	<b>5B</b>	25.6	11.5	1.1	9.0	AW 70
type 2	<b>5B</b>	27.3	9.5	1.1	9.0	AW 71, AW 72 L
Control valve, rear clutch	<b>4C</b>	37.6	14.5	1.2	9.2	
Governor modulator valve	<b>(3B)</b>	36.1	12.0	0.7	9.1	AW 70, AW 71
Modulator valve, manual 2-1	<b>2B</b>	42.4	15.0	0.8	9.2	earlier type, yellow
Downshift valve, manual 3-2	<b>1B</b>	35.1	12.5	0.8	9.0	
Downshift valve, manual 2-1	<b>3C</b>	34.6	13.0	0.6	7.6	
Shift valve, manual 4-3	<b>2C</b>	—	—	—	—	No spring
Relief valve	<b>1C</b>	32.1	9.0	2.0	13.1	
By-pass valve	<b>13C</b>	33.3	7.0	1.3	13.8	
Shift valve 3-4						
type 1	<b>6C</b>	37.9	14.5	1.1	10.6	AW 70
type 2	<b>6C</b>	33.65	14.5	1.1	10.6	AW 71
Primary valve						
type 1	<b>8C</b>	73.3	15.0	1.6	16.7	AW 70
type 2	<b>8C</b>	61.2	13.0	1.8	17.2	AW 71
Secondary regulator valve	<b>3A</b>	71.3	15.0	1.9	17.4	
Signal valve, lock-up	<b>9C</b>	37.8	12.5	1.1	9.6	AW 70 L (1208652) AW 72 L, green
	<b>9C</b>	37.0	13.0	1.1	9.6	AW 71 L (1208417, 643)
	<b>9C</b>	37.4	13.5	1.1	9.7	AW 70 L (1208563, 604) dark red
Changeover valve, lock-up	<b>10C</b>	18.5	13.5	0.5	5.2	white

**Note:** The table may be used only for identifying the springs during assembly. A spring is not necessarily defective if a parameter, such as the spring length, does not agree exactly with the specified value. Special test equipment is required to determine whether or not the spring characteristics are acceptable.

<sup>1)</sup> A = Upper front valve body

B = Upper rear valve body

C = Lower valve body

<sup>2)</sup> Two springs in accumulator piston C2

**Accumulator pistons, accumulator springs**

Transmission Volvo P/N	Accumulator-piston			Accumulator spring																										
	C1	C2	B2	C1	C2						B2																			
	1239584	1239825	1340064 (double springs)	1239823	1340127 (double springs)	1239583	1239953 (yellow)	1340060 (black)	1239746 (yellow)	1239824 (white)	1239926 (orange)	1340041	1340062 (white)	1340063 (red)	3520954 (green)	1340128 (blue)	3520337 (green)	3502176 (orange)	1239822 (light green)	1239876 (red)	1239952 (green)	1340035 (light blue)	1340132 (light grey)	1340131 (red)	3502156 (light green)	3502174 (natural)	3502175	6814941 (yellow)		
AW 71 L 1208643 <sup>1</sup>	•		•	•				•						•	•															•
AW 71 1208642 <sup>1</sup>	•		•	•				•						•	•					•										
AW 72 L 1208666 <sup>1</sup>	•		•	•				•								•		•												•
AW 72 L 1208667 <sup>1</sup>	•		•	•				•								•		•												•
AW 71 1208661	•	•		•				•			•											•								
AW 70 1208659	•	•		•		•												•									•			
AW 70 L 1208652 <sup>2</sup>	•	•			•			•	•														•	•						
AW 72 L 1208638 <sup>1</sup>	•		•	•				•								•		•												•
AW 72 L 1208637 <sup>1</sup>	•		•	•				•								•		•												•
AW 70 L 1208604 <sup>2</sup>	•	•			•			•	•														•	•						
AW 70 L 1208563 <sup>2</sup>	•	•			•			•	•														•	•						
AW 71 1208534 <sup>1,2</sup>	•		•		•			•					•	•										•				•		
AW 71 1208533 <sup>1</sup>	•		•	•				•								•		•									•			
AW 71 1208532 <sup>1</sup>	•		•	•				•								•		•									•			
AW 71 L 1208417 <sup>1,2</sup>	•		•		•			• <sup>3</sup>	• <sup>4</sup>				•			•							•	•			•			
AW 70 1208415	•	•		•		•			•															•						
AW 71 L 1208371 <sup>1</sup>	•		•	•				• <sup>3</sup>	• <sup>4</sup>				•	•								•								
AW 71 1208360	•	•		•				• <sup>3</sup>	• <sup>4</sup>				•									•								
AW 71 1208334	•	•		•				• <sup>3</sup>	• <sup>4</sup>				•										•							
AW 70 1208332	•	•		•		•			•														•							
AW 70 1208314	•	•		•		•			•														•							
AW 71 1208310	•	•		•				• <sup>3</sup>	• <sup>4</sup>				•									•								
AW 71 1208304	•	•		•				• <sup>3</sup>	• <sup>4</sup>				•										•							
AW 71 1208300	•	•		•				•								•						•								
AW 71 1208248	•	•		•		• <sup>3</sup>		• <sup>4</sup>				•										•								

<sup>1</sup> Double springs in piston C2.

<sup>2</sup> Double springs in B2.

<sup>3</sup> From May 1985.

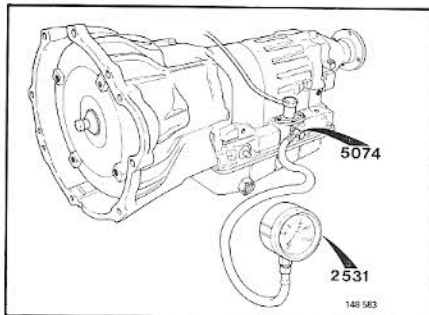
<sup>4</sup> To April 195 inclusive.



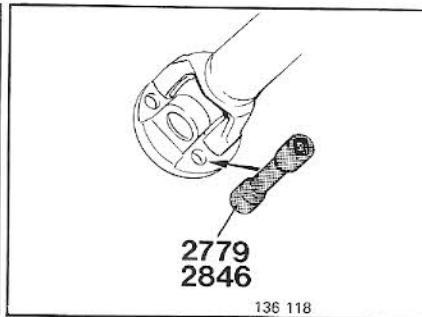


# Special tools

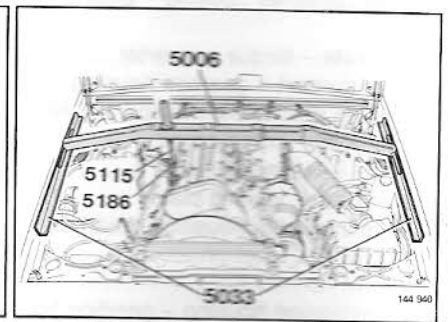
999-	Description - use
2531-5	Pressure gauge (2500 kPa = 360 psi) - for measuring line pressure
2779-0	Wrench (11 mm) - for removing/installing drive coupling bolts
2846-7	Wrench (9/16") - for removing/installing drive coupling bolts
5006-5	Lifting beam - for lifting engine
5033-9	Support rails - for lifting engine
5069-3	Extractor - for removing oil pump seal
5071-9	Extractor - for oil pump
5074-3	Connector - for measuring oil pressure (used with 2532, 5114)
5076-8	Holder - for accumulator pistons
5114-7	Pressure gauge (1000 kPa = 145 psi) - for measuring governor pressure



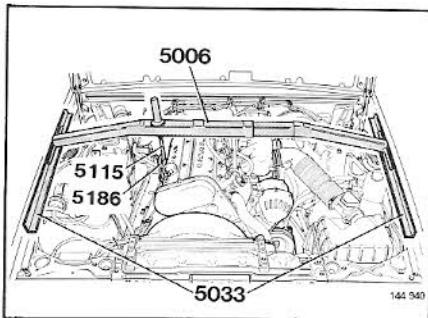
2531



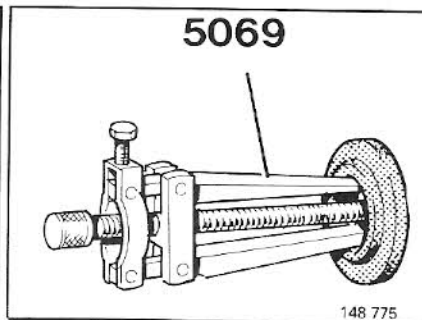
2779, 2846



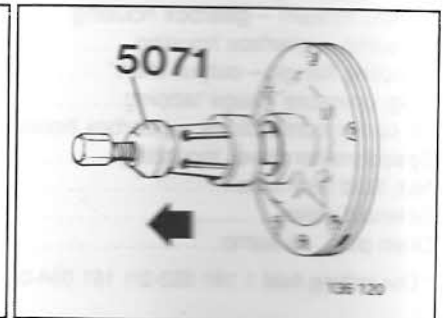
5006



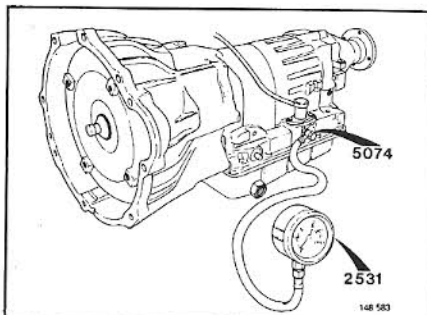
5033



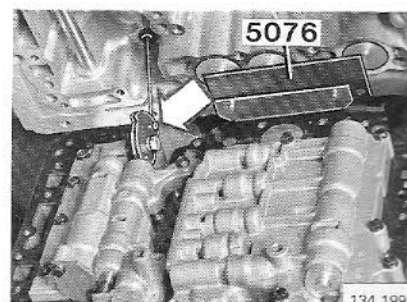
5069



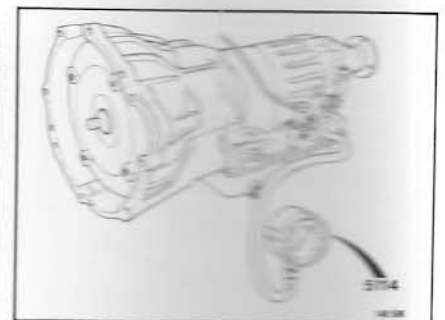
5071



5074

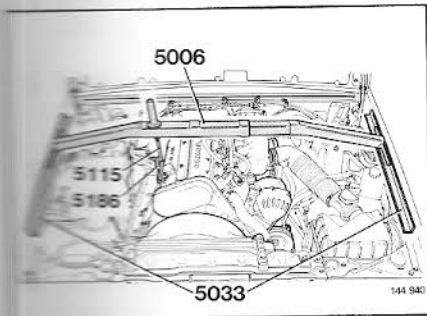


5076

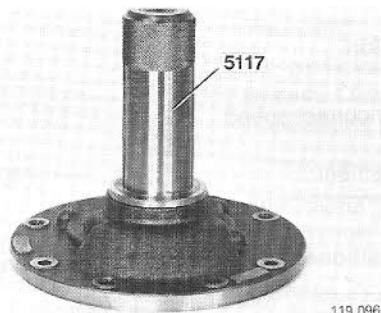


5114

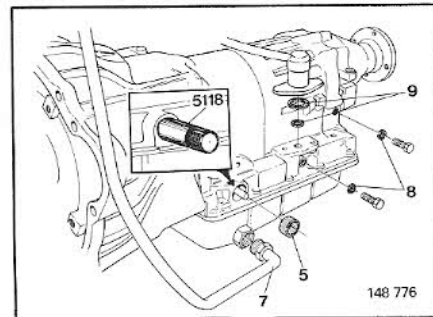
999-	Description – use
5115-4	<b>Lifting hook</b> – for lifting engine
5117-0	<b>Drift</b> – for installing oil pump seal
5118-8	<b>Drift</b> – for installing gear selector shaft seal
5149-3	<b>Counterhold</b> – for drive flange
5186-5	<b>Lifting hook</b> – for lifting engine
5225-1	<b>Drift</b> – for removing/installing rubber bush in gearbox mounting (B 28)
5241-8	<b>Guide pins</b> – for overdrive unit
5244-2	<b>15 mm socket</b> – for removal/installation of drive coupling bolts
5972-8	<b>Universal fixture</b> – for removal/installation of transmission



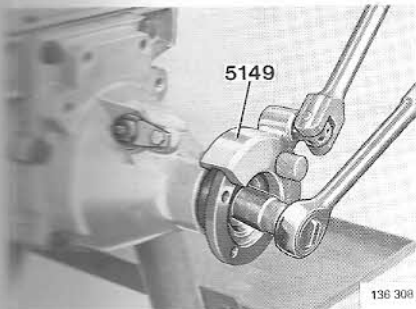
5115



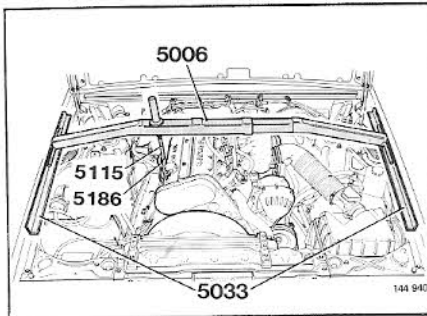
5117



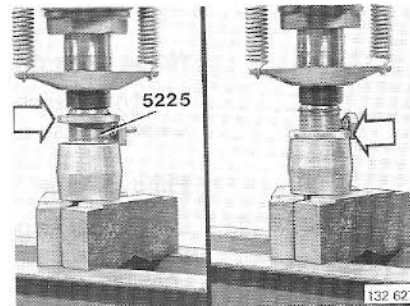
5118



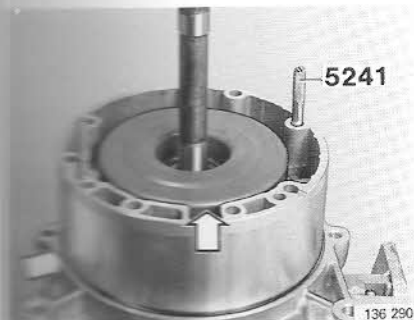
5149



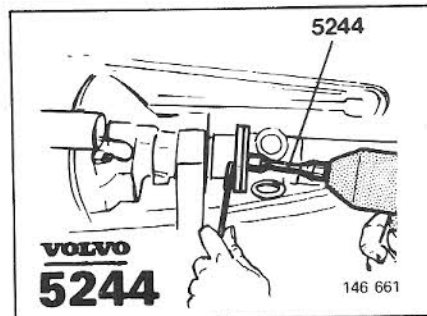
5186



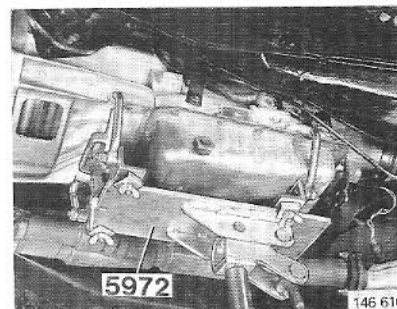
5225



5241



5244



5972

# Fault tracing

## Contents

	Page
<b>Faulty operation</b>	
Inoperable or delayed parking lock .....	49
<i>No forward propulsion</i> .....	49
No forward propulsion in positions 2 or D (transmission cold) .....	50
No rearward propulsion .....	50
Inoperable or delayed gear shifting .....	51
Hard engagement – noise on disengagement .....	51
No shift from 3rd to 4th .....	52
No kickdown from 4th to 3rd .....	52
No manual downshift from 4th to 3rd .....	52
No engine braking in 3rd .....	52
No engine braking in 2nd .....	52
No engine braking in 1st .....	53
<b>Faulty lock-up function</b>	
Lock-up inoperable .....	53
Lock-up engaged at incorrect speed .....	53
Hard engagement .....	53
Loud noise on engagement .....	53
Groaning noise after engagement .....	54
<b>Noise in selector positions N or P (car at rest with engine running)</b>	
High, whining noise increasing with engine speed .....	54
Grating noise .....	54
Squeaking noise .....	54
<b>Noise in selector positions D or R (engine running, brakes locked)</b>	
Sighing or continuous low-frequency noise, especially at full throttle .....	55
<b>Noise while driving</b>	
Loud noise such as knock or metallic noise in any of gears (not direct drive) .....	55
Clicking noise on starting .....	55
<b>Fluid leakage</b>	
Leakage at standstill .....	55
Leakage at standstill with engine running .....	56
Leakage while driving .....	56
Leakage at front of unit .....	56

### Faulty operation

AA1

#### Inoperable or delayed parking lock

1. **Check operation of gear selector lever in all positions.**  
 Faulty operation ..... see item 2  
 Satisfactory operation ..... see item 3
2. **Check adjustment of gear selector lever**  
 (Operations H1-H8). Adjust. Replace faulty components.  
**No change:** Check for play in gear selector mechanism in gearbox.  
 Remove oil sump (operations K2-K3).  
 Inspect and adjust as required.  
 No change ..... see item 3

3. **Inspect parking lock components.**  
 Remove oil sump and control system.  
 (Operations K1-K16)  
 Replace faulty components.  
**If fault persists:** Replace (or overhaul) transmission. (Operations R1-R15, S1-S29)  
 Front ring gear in planetary drive assembly is probably damaged.

#### No forward propulsion

AA2

Check:

1. **Fluid level**  
 (Operations A1-A4)
2. **Throttle cable adjustment**  
 (Operations J1-J10)
3. **Gear selector mechanism.** Check adjustment and operation.  
 (Operations H1-H8)
4. **Transmission "pulls" in 1st gear:**  
 Transmission "pulls" ..... see item 6
5. **Line pressure and stall speed.**  
 (Operations E1-E14)  
 Correct ..... see item 6  
 Incorrect ..... see item 7
6. **Freewheel**  
 Disconnect propeller shaft and turn drive flange. Movement should be more sluggish in clockwise direction (as viewed from rear).  
 Same in both directions<sup>1)</sup> ..... see item 8  
 Correct<sup>2)</sup> ..... see item 8

7. **Inspect sump for particles.**  
 (Operations K2-K3)  
 Particles<sup>2)</sup> ..... see item 8  
**No particles:** Replace (or clean and inspect) control system. Clean (or replace) oil filter.  
 (Operations K1-K16)  
 Check gear selector mechanism (M1-M16). Check accumulator piston C1 (N1-N9)  
 No change<sup>2)</sup> ..... see item 8

8. **Replace (or overhaul) transmission.**  
 (Operations R1-R15, S1-S29)

<sup>1)</sup> Freewheel F2 probably faulty.  
<sup>2)</sup> Clutch C1 probably faulty.

Fault tracing

**No forward propulsion in positions 2 or D (transmission cold)**

AA3

<p><b>Check/inspect:</b></p> <p><b>1. Fluid level</b> (Operations A1–A4)</p> <p><b>2. Throttle cable adjustment</b> (Operations J1–J10)</p> <p><b>3. Gear selector mechanism.</b> Check adjustment and operation. (Operations H1–H8)</p> <p><b>4. Line pressure and stall speed.</b> (Operations E1–E14)</p> <p><b>Correct</b> ..... see item 5  <b>Correct but falls after a couple of seconds</b> ..... see item 6  <b>Incorrect</b> ..... see item 7</p> <p><b>5. Freewheel</b> Disconnect propeller shaft and turn drive flange. Movement should be more sluggish in clockwise direction (as viewed from rear).</p> <p><b>Same in both directions</b><sup>1)</sup> ..... see item 8  <b>Correct</b><sup>2)</sup> ..... see item 8</p>	<p><b>6. Inspect sump for particles.</b> (Operations K2–K3)</p> <p><b>Particles</b><sup>2)</sup> ..... see item 8  <b>No particles:</b> Replace control system (operations K1–K16). Check secondary regulator valve and replace if earlier version fitted.  <b>No change</b><sup>2)</sup> ..... see item 8</p> <p><b>7. Inspect sump for particles</b> (Operations K2–K3)</p> <p><b>Particles</b><sup>2)</sup> ..... see item 8  <b>No particles:</b> Replace (or clean and inspect) control system.  <b>Clean (or replace) oil filter.</b> (Operations K1–K16) Check O-rings and accumulator pistons. (Operations N1–N9)  <b>No change</b><sup>2)</sup> ..... see item 8</p> <p><b>8. Replace (or overhaul) transmission.</b> (Operations R1–R15, S1–S29)</p> <p><sup>1)</sup> Freewheel F2 probably faulty.  <sup>2)</sup> Hydraulic brakes and/or clutches probably faulty</p>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**No rearward propulsion**

AA4

<p><b>Check/inspect:</b></p> <p><b>1. Fluid level</b> (Operations A1–A4)</p> <p><b>2. Throttle cable adjustment</b> (Operations J1–J10)</p> <p><b>3. Gear selector mechanism.</b> Check adjustment and operation. (Operations H1–H8)</p> <p><b>4. Line pressure and stall speed.</b> (Operations E1–E14)</p> <p><b>Correct</b> (no pressure) ..... see item 5  <b>Incorrect</b> ..... see item 6</p>	<p><b>5. Inspect sump for particles.</b> (Operations K2–K3)</p> <p><b>Particles</b> ..... see item 8  <b>No particles:</b> Replace control system (operations K1–K16). Alternatively, clean and inspect primary regulator valve, shift valve 2–3 and rear brake B3 control valve. Inspect accumulator piston C2 (operations N1–N9). Inspect centre support unit mounting bolts (operation AZ22 in Service Manual, Section 4 (43) Reconditioning). Check gear selector mechanism.  <b>No change</b> ..... see item 6</p> <p><b>6. Replace (or overhaul) transmission.</b> (Operations R1–R15, S1–S29). Internal fault is probably present in one of following components: Clutch C2, centre support unit, planetary drive assembly or brake B3.</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Inoperable or delayed gear shifting (starting in 2nd or 3rd)**

AA5

<p><b>Check/inspect:</b></p> <p><b>1. Fluid level</b> (Operations A1–A4)</p> <p><b>2. Throttle cable adjustment</b> (Operations J1–J10)</p> <p><b>3. Gear selector mechanism.</b> Check adjustment and operation. (Operations H1–H8)</p> <p><b>4. Line pressure and stall speed.</b> (Operations E1–E14) <b>Incorrect</b> (high pressure) ..... see item 6</p> <p><b>5. Check that governor pressure varies with speed.</b> (Operations F1–F6) <b>Correct</b> ..... see item 6 <b>Incorrect pressure or correct pressure but delayed shifting</b> ..... see item 7</p>	<p><b>6. Inspect sump for particles.</b> (Operations K2–K3) <b>Particles</b><sup>1)</sup> ..... see item 8 <b>No particles:</b> Replace control system. Alternatively, inspect primary regulator valve, throttle valve, shift valves 1–2 and 2–3, and cutback valve. <b>No change</b><sup>2)</sup> ..... see item 8</p> <p><b>7. Inspect governor.</b> (Operations 01–06) <b>No change</b> ..... see item 6</p> <p><b>8. Replace (or overhaul) transmission.</b> (Operations R1–R15, S1–S29) <sup>1)</sup> Component failure. Alternatively, faulty seal between output shaft and gearbox housing, or control system fault. <sup>2)</sup> Hydraulic fault in a clutch or brake.</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Hard engagement – noise on disengagement**

AA6

<p><b>Check/inspect:</b></p> <p><b>1. Level and odour of fluid.</b> (Operations A1–A4)</p> <p><b>2. Gear selector mechanism.</b> Check adjustment and operation. (Operations H1–H8)</p> <p><b>3. Throttle cable adjustment</b> (Operations J1–J10)</p> <p><b>4. Line pressure and stall speed.</b> (Operations E1–E14) <b>Correct</b> ..... see item 5 <b>Incorrect</b> ..... see item 6</p> <p><b>5. Inspect sump for particles.</b> (Operations K2–K3) <b>Particles</b><sup>1)</sup> ..... see item 7 <b>No particles:</b> Inspect accumulator pistons and bores in gearbox housing. (Operations N1–N9) <b>No change</b> ..... see item 7</p>	<p><b>6. Inspect sump for particles.</b> (Operations K2–K3) <b>Particles</b> ..... see item 7 <b>No particles:</b> Replace control system. (Operations K1–K16) <b>Alternatively, inspect:</b> Throttle valve, primary regulator valve and accumulator pistons. <b>No change</b> ..... see item 7</p> <p><b>7. Replace (or overhaul) transmission.</b> (Operations R1–R15, S1–S29)</p>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Fault tracing

AA7

**No shift from 3rd to 4th**

Probable fault	Action	Operation(s)
Dirt in governor	Dismantle governor. Clean. Check pressure.	O1-O6 F1-F6
Shift valve 3-4 sticking	Dismantle valve. Clean, polish, inspect. See Service Manual, Section 4 (43) Reconditioning.	AD8 <sup>1)</sup> AG <sup>3)</sup>
Fault in brake B0	Inspect B0. See Service Manual, Section 4 (43) Reconditioning.	E1-E4 <sup>1)</sup> Q1-Q14 <sup>1)</sup>

AA8

**No kickdown from 4th to 3rd**

Probable fault	Action	Operation(s)
Downshift valve 4-3, manual	Dismantle valve. Clean, polish, inspect. See Service Manual, Section 4 (43) Overhauling.	AD10 <sup>1)</sup> AG4-AG5 AG11 <sup>1)</sup>

AA9

**No manual downshift from 4th to 3rd**

Probable fault	Action	Operation(s)
Faulty solenoid valve	Replace valve.	P1-P6

AA10

**No engine braking in 3rd**

Probable fault	Action	Operation(s)
Clutch C0	Check steel and friction plates. Check springs and piston. See Service Manual, Section 4 (43) Reconditioning.	C1-C5 <sup>1)</sup> O1-O8 <sup>1)</sup>

<sup>1)</sup> Refers to operations in Service Manual, Section 4 (43). Reconditioning, AW 70/AW 71/AW 72 L Automatic transmissions, 700

AA11

**No engine braking in 2nd**

Probable fault	Action	Operation(s)
Clutch C0	Check steel and friction plates.	C1-C5 <sup>1)</sup> O1-O8 <sup>1)</sup>
and/or	Check springs and piston. See Service Manual, Section 4 (43) Reconditioning	
Brake B1	Check steel and friction plates. Check springs and piston. See Service Manual, Section 4 (43) Reconditioning.	H1-H8 <sup>1)</sup> T1-T7 <sup>1)</sup>

AA12

**No engine braking in 1st**

Probable fault	Action	Operation(s)
Clutch C0	Check steel and friction plates.	C1-C5 <sup>1)</sup> O1-O8 <sup>1)</sup>
and/or	Check springs and piston. See Service Manual, Section 4 (43) Reconditioning.	
Brake B3	Check steel and friction plates. Check springs and piston. See Service Manual, Section 4 (43) Reconditioning.	A26-A27 T1-T2 AZ1-AZ3

**Faulty lock-up function**

AA13

**Lock-up inoperable**

Probable fault	Action	Operation(s)
Transmission not shifting into 4th		
Faulty torsion damper in torque converter	Replace torque converter.	R1-R15 S1-S29

<sup>1)</sup> Refers to operations in Service Manual, Section 4 (43) Reconditioning, AW 70/AW 71/AW 72 L Automatic transmissions, 700

AA14

**Lock-up engaged at incorrect speed**

Probable fault	Action	Operation(s)
Signal valve sticking	Dismantle valve. Clean, polish, inspect. See Service Manual, Section 4 (43) Reconditioning.	AD8 <sup>1)</sup> AG8 <sup>1)</sup>
Incorrect governor pressure	Dismantle and clean governor. Check pressure.	O1-O6 F1-F6

AA15

**Hard engagement**

Probable fault	Action	Operation(s)
Faulty torsion damper in torque converter	Replace torque converter.	R1-R15 S1-S29
Changeover valve sticking	Dismantle valve. Clean, polish, inspect. See Service Manual, Section 4 (43) Reconditioning.	AD5 <sup>1)</sup> AG9-AG10 <sup>1)</sup>

AA16

**Loud noise on engagement**

Probable fault	Action	Operation(s)
Faulty torsion damper in torque converter	Replace torque converter.	R1-R15 S1-S29

**Groaning noise after engagement**

Probable fault	Action	Operation(s)
Engagement at excessively low road speed	Check signal valve.	AD8 <sup>1)</sup> AG8 <sup>1)</sup>
	Check changeover valve.	AD5 <sup>1)</sup> AG9-AG10 <sup>1)</sup>
	Clean and polish valves. See Service Manual, Section 4 (43) Reconditioning.	

<sup>1)</sup> Refers to operations in Service Manual, Section 4 (43) Reconditioning, AW70/AW71/AW72L Automatic transmissions, 700

**Noise in selector positions N or P (car at rest with engine running)**

**High, whining noise increasing with engine speed**

Probable fault	Action	Operation(s)
Low fluid level	Top up level.	A1-A4
Blocked oil strainer	Clean strainer (replace if necessary).	K2-K4
Worn oil pump	Replace oil pump.	D13, D16, R1-R15, S1-S29
Torque converter fault	Replace torque converter.	R1-R15, S1-S29
Internal gearbox fault	Replace (or overhaul) gearbox.	R1-R15, S1-S29

**Grating noise**

Probable fault	Action	Operation(s)
Broken carrier plate	Replace carrier plate.	R1-R15, S1-S29
Torque converter rubbing against housing	Replace torque converter.	R1-R15, S1-S29
Torque converter housing insecurely fastened to engine	Check security of mounting (guide pins etc.)	R1-R15, S1-S29 R7, S15
Internal fault (planetary drive assembly or other component)	Replace (or overhaul) gearbox.	R1-R15, S1-S29

**Squeaking noise**

Probable fault	Action	Operation(s)
Worn bushing in oil pump (for torque converter bearing)	Replace oil pump and (if necessary) torque converter.	D13, D16
Torque converter housing guide pins loose/missing	Correct.	R1-R15, S1-S29

**Noise in selector positions D or R (engine running, brakes locked)**

Noise as described in AA18–AA20 is corrected as specified in those cases.

AA21

**Sighing or continuous low-frequency noise, especially at full throttle (usually accompanied by low stall speed)**

Probable fault	Action	Operation(s)
Stator slipping in torque converter	Replace torque converter and fluid.	R1–R15, S1–S29 A1–A4, C1–C2

**Noise while driving**

Noise as described in AA18–AA20 is corrected as specified in those cases.

AA22

**Loud noise such as knock or metallic noise in any of gears (not direct drive)**

Probable fault	Action	Operation(s)
Internal fault (for example, damaged tooth in planetary train)	Replace (or overhaul) gearbox.	R1–R15, S1–S29

AA23

**Clicking noise on starting**

Probable fault	Action	Operation(s)
Parking pawl only partly engaged	Remove control system. Inspect parking pawl and front ring gear in planetary gear assembly.	K1–K16
	If ring gear is damaged: Replace (or overhaul) gearbox.	R1–R15, S1–S29

**Fluid leakage**

AA24

**Leakage at standstill**

Probable fault	Action	Operation(s)
Defective gasket or oil cooler connection	Clean, locate and correct leak.	D1–D16

**Leakage at standstill with engine running**

Probable fault	Action	Operation(s)
Leakage at front of unit:	Correct fluid level.	A1–A4
– high fluid level		
– pump bushing damaged/loose	Replace oil pump.	D12–D16
– oil pump seal worn or damaged	Replace seal.	D13
– torque converter throat damaged	Replace torque converter.	
– torque converter housing insecurely attached to engine	Tighten, adjust.	R1–R15, S1–S29
Leakage from fluid filler tube (after driving)	Wipe dry. Inspect.	D9

**Leakage while driving**

Probable fault	Action	Operation(s)
Leakage from rear extension gasket or seal	Replace gasket and seal.	D3–D4
Leakage from seals	Inspect. Replace seals.	D1–D14
Leakage from front	See under 'Leakage at standstill'.	AA24–AA25

Leakage at front	3. Does leakage occur during hard highway driving or towing?
<p><b>1. Check if fluid level is high and if fluid is burnt, overheated or gives off burnt odour.</b> (Operations A1–A4, B1–B10) <b>Correct</b> ..... see item 3 <b>Fluid burnt, gives off burnt odour etc.</b>... see item 2</p> <p><b>2. Check for particles in sump.</b> (Operations K2–K3) <b>Particles:</b> Probable internal fault. Replace (or overhaul) transmission. (Operations R1–R15, S1–S29) <b>No particles</b> ..... see item 3</p>	<p><b>Yes</b> ..... See fault symptoms on page 59 <b>No:</b> Probable leakage from: Torque converter, torque converter bearing in pump bushing, or leakage due to insecure attachment of torque converter housing to engine. Correct leakage or replace transmission (operations R1–R15, S1–S29).</p>

# Repair/maintenance

## Contents

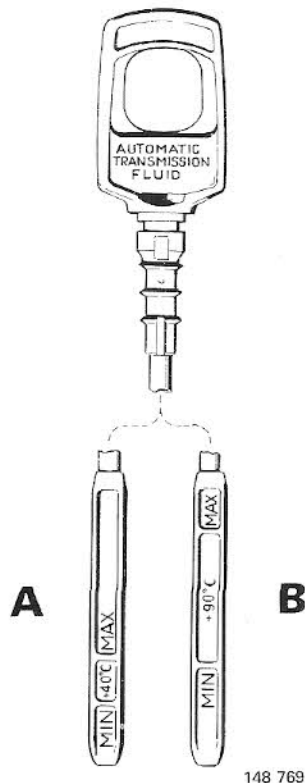
	Page
Cleanliness .....	58
Checking fluid .....	58
Fluid, replacement .....	60
Oil cooling system, cleaning .....	62
Oil seals, replacement .....	63
Line pressure, measurement .....	67
Governor pressure, measurement .....	72
Start inhibitor switch/reversing light switch, replacement .....	74
Gear selector mechanism, inspection/adjustment .....	76
Kickdown cable, replacement/adjustment .....	78
Control system, removal/installation (replacement) .....	81
Delayed engagement – replacement of upper front valve body, AW 70/71 .....	84
Gear selector mechanism, replacement .....	90
Accumulator pistons, replacement .....	92
Governor, dismantling/reassembly .....	94
Solenoid valve, replacement .....	96
Kickdown indicator, adjustment .....	97
Transmission, replacement .....	98
Exchange system, automatic transmissions .....	110

## Cleanliness

**Important!** Cleanliness is extremely important when working on automatic transmissions, particularly when checking, topping up and changing the fluid.

Clean around the filler tube and drain plug. Use clean containers. Ensure that the workplace is free of dust and dirt.

## Checking fluid



A = Cold range      B = Hot range

At ambient temperature (+20°C = 68°F), the fluid level will normally be within the 'cold' range (+40°C = 104°F). This is reached after approx. 10 minutes of idling at ambient temperature.

The hot range is used to check the level at normal working temperature (reached after approx. 30 minutes of highway driving).

### Checking level

A1

#### Conditions:

Car parked on level surface with engine idling and gear selector in position P.

Operate the footbrake or apply the handbrake. Select each gear position in turn, remaining in each for 4–5 seconds. Return the lever to position P and wait approx. 2 minutes before checking the fluid level.

**Note:** Wipe the dipstick with a nylon or chamois cloth i.e. not with a cloth which may leave fluff or threads.

### High level

A2

**Warning!** Fluid may be extremely hot if car has recently been driven.

Drain off fluid.

Disconnect filler tube from sump. Allow some fluid to run off and replace tube.

Check fluid level. Repeat until level is correct.

Filler tube tightening torque: 90 Nm (66 ft.lb).

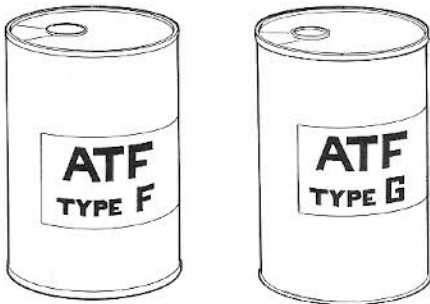
Check that no water is present in fluid (in which case, fluid will be whitish in colour). If so, transmission must be removed and cleaned, and oil cooler repaired or replaced.

High load may also cause high level due to abnormally high fluid temperature.

### Low level

A3

Top up fluid to between maximum and minimum markings on dipstick.



119 008



139 187

### Grade of fluid

**Models to 1983 inclusive:** ATF fluid, type F or G

**Models from 1984 on:** ATF fluid, type Dexron II D.

**Important:** Dexron fluid must not be mixed with other types.

**Important!** Under **no** circumstances may additives be added to transmission fluid.

Check that the low level is not due to leakage.

Checking at a temperature lower than +5°C (41°F) may give an incorrect level. Driving with low fluid level will cause foaming of the fluid (accompanied by a droning noise) which, in turn, may also give an incorrect level.

#### Top-up quantities (in litres) when:

- Removing oil sump (e.g. when replacing gasket) . . . 3.3  
Before starting engine top up with . . . . . 2.7
- Overhauling control system in car . . . . . 5.5  
Before starting engine top up with . . . . . 5.0
- Overhauling transmission and installing new torque converter . . . . . 7.5  
Before starting engine top up with . . . . . 7.0
- Overhauling transmission and re-installing original torque converter . . . . . 6.5  
Before starting engine top up with . . . . . 6.1  
(Torque converter cannot be drained fully)

**Important!** Add 300 cc if car is fitted with extra oil cooler (which may also be installed as an accessory).

### Fluid discoloured or gives off burnt odour

A4

Remove oil sump. Inspect for impurities in the form of abnormal quantities of particles of steel, aluminium or lining materials.

#### Impurities in transmission:

Replace transmission (see operations R1–R4 and S1–S23). If appropriate, dismantle transmission and identify cause.

Replace damaged components. If no fault is found in gear-box, particles have probably originated in torque converter. In this case, replace converter, and clean oil cooler and pipes.

#### No impurities in transmission:

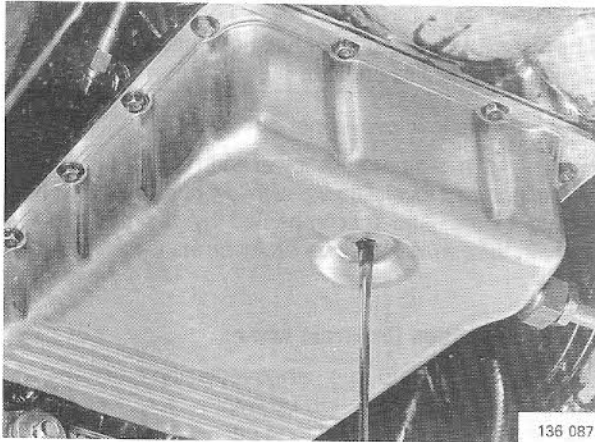
Change fluid and clean oil sump, oil strainer, particle magnet(s) and oil cooler (see operations B1–B2).

Alternatively, replace transmission (operations R1–R5 and S1–S29 respectively).

If oil is discoloured or burnt due to hard driving or towing a caravan, although transmission is functioning correctly, top up with fresh fluid as described in operations C1–C2. In other words, top up until clean fluid runs continuously from return pipe.

## Fluid, replacement

**Important!** Use correct grade of fluid. See operation A3.



### Gearbox with drain plug

B1

Remove plug and drain off fluid

B2

Undo rear (return) oil cooler pipe connection

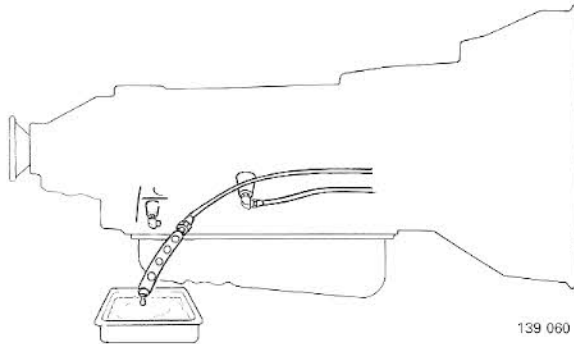
B3

Connect transparent plastic tube to pipe  
Refit plug in sump

B4

### Add approx. 2 litres of fluid

1. Start engine and allow to idle.
2. Stop engine when air bubbles appear in hose.
3. Add approx. 2 litres of fluid.
4. Repeat steps 1–2. Reconnect pipe to gearbox.



### Gearbox without drain plug

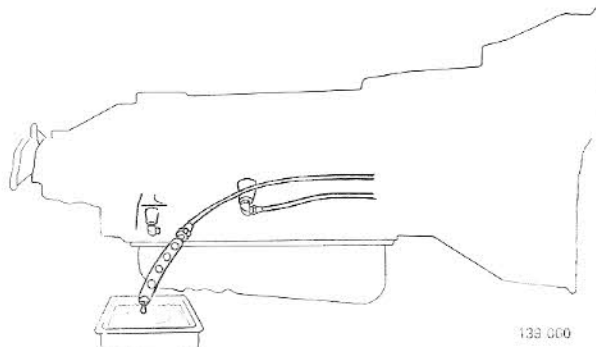
B5

Undo rear return oil cooler pipe connection

Connect transparent plastic tube to pipe.

B6

1. Start engine and allow to idle.
2. Stop engine when air bubbles appear in hose.
3. Add approx. 2 litres of fluid.
4. Repeat steps 1–3.
5. Repeat steps 1–2. (Transmission is now drained of fluid.) Reconnect pipe to gearbox.



## All gearboxes

B7

Add approx. 2 litres of fluid

B8

Apply handbrake

Start engine and allow to idle. Move selector lever through gear positions

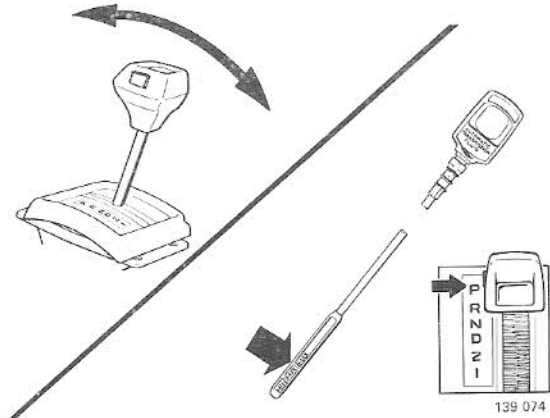
B9

Place selector lever in position P. Wait 2 minutes and check fluid level

Top up as required.

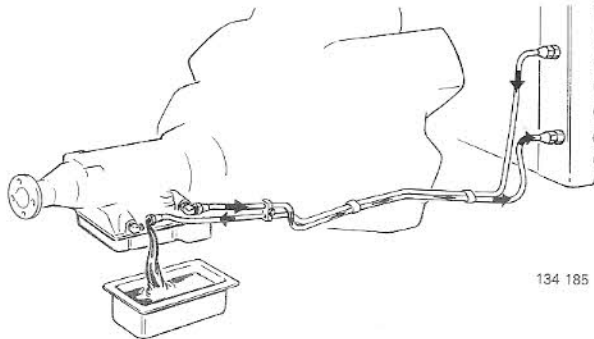
B10

Stop engine



## Oil system, cleaning

C1



134 185

Place container under rear oil pipe (return pipe). Disconnect pipe from gearbox.

Overfill transmission with approx. 0.3 l of fluid.

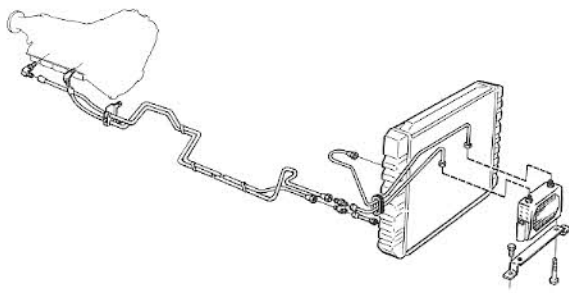
**Important!** Use correct grade of fluid. See operation A3.

Start engine and allow to idle. Collect contaminated or burnt fluid from return pipe.

Stop engine when clean fluid emerges from pipe. Reconnect pipe.

Check fluid level (see operations A1–A4).

C2



139 840

### Extra oil cooler (cleaned separately)

Undo connections between ordinary cooler and extra cooler. Connect extra cooler to oil filler pump and pump clean fluid through unit. Remake connections with ordinary cooler. Check for leaks.

## Oil seals, replacement

Special tools: 5069, 5075, 5117, 5118, 5149, 5241, 5244

D1

### Inspect for leaks

First, check that leakage is not due to high fluid level, i.e. that fluid is being discharged through the vent at top of torque converter housing. Also check oil cooler connections and pressure tapping plugs, which are other possible leakage points.

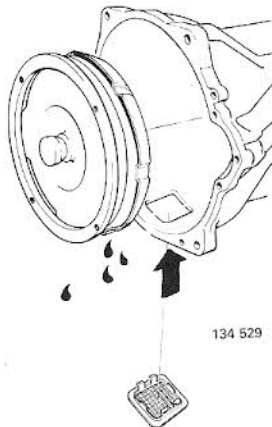
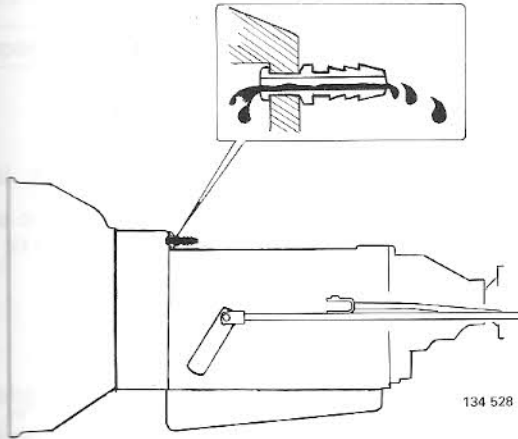
In event of other leakage: Clean transmission and determine whether or not leakage can be corrected with unit in position.

D2

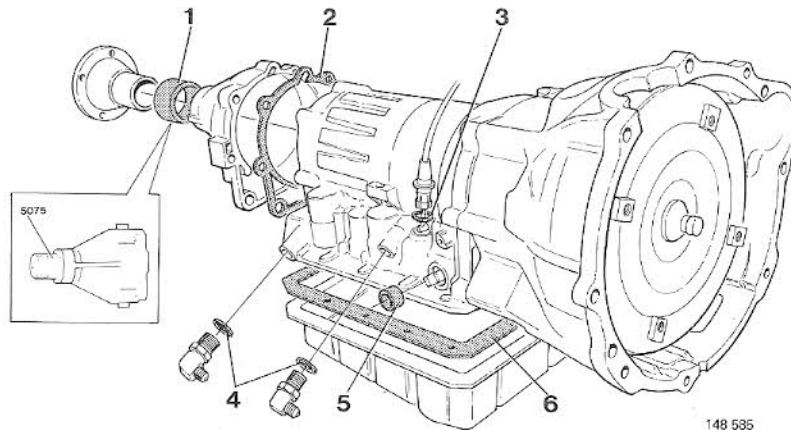
### Leakage from welded joint on torque converter

Insert a piece of paper in opening in bottom of torque converter housing. Idle engine for a few minutes.

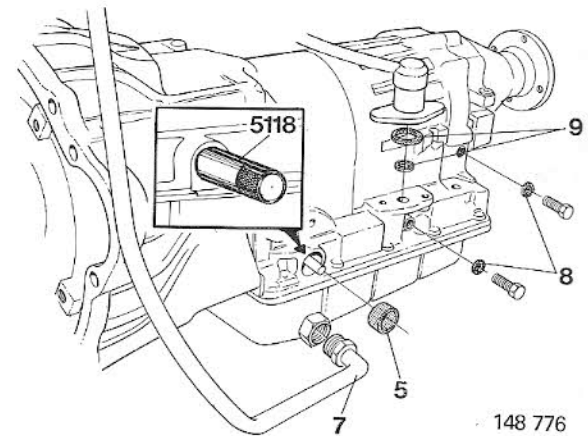
Examine paper for spots of fluid. No spotting should be present.



## Replacement of seals in car



148 535



148 776

- 1 Seal, drive flange
- 2 Gasket, rear extension housing
- 3 O-ring, kickdown

- 4 O-rings, oil cooler connections
- 5 Seals, gear selector shaft
- 6 Gasket, oil sump

- 7 Filler tube, oil sump
- 8 O-rings, pressure gauge tapings
- 9 O-rings, solenoid valve

D3

### Seal, drive flange (1)

Remove propeller shaft. Use socket **5244**. Remove drive flange using counterhold **5149**. Use screwdriver to remove seal.

Install new seal.

Use drift **5075**. Press seal onto tool and install. **Note:** Ensure that seal is not misaligned.

*Remount drive flange. Apply locking fluid to threads of centre bolt and tighten. Torque: **45 Nm** (33 ft.lb).*

Install propeller shaft.

D4

### Gasket, rear extension housing (2)

Remove rear extension housing. See operation O1. Replace gasket. Reinstall housing as described in operations O5–O6.

D5

### *During kickdown cable (J)*

Disconnect cable from throttle. Release cable at lower end in gearbox and remove O-ring. See operations J2–J9.

D6

D9

**O-rings, oil cooler connections (4)**

Disconnect pipes from gearbox. Note positions of connections. Remove connections and O-rings. Reinstall connections and pipes using new O-rings.

Check fluid level and top up as required. See operation A3.

**Important!** Use correct grade of fluid.

D7

**Seal, gear selector shaft (5)**

Prise out seal with screwdriver and install new seal using drift 5118.

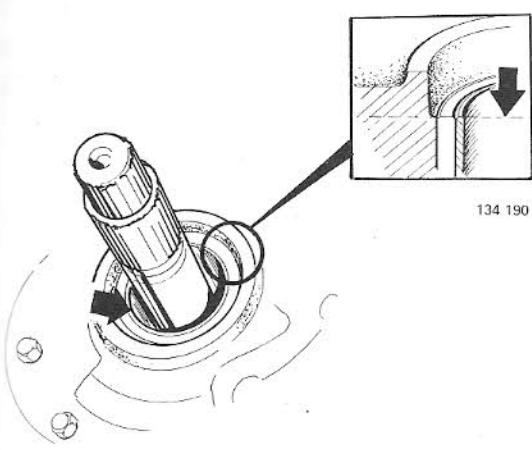
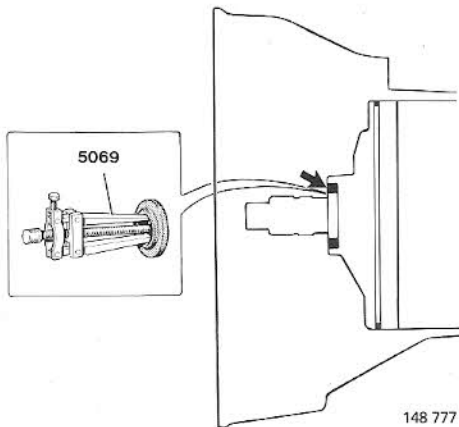
D8

**Gasket, oil sump (6)**

Remove oil sump (see operations K1–K3). Replace gasket. Install sump (operations K14–K15) and fill system with fluid.

**Important!** Use correct grade of fluid. See operation A3.

Torque: 4–5 Nm (3–3.5 ft.lb)



**Filler tube, oil sump (7)**

Seal is not fitted between tube and oil sump on production models. Check security of attachment. Replace faulty components.

Torque: 80–100 Nm (59–74 ft.lb)

D10

**O-rings, pressure gauge tappings (8)**

Torque: 5–9 Nm (3.5–6.5 ft.lb)

D11

**O-rings, solenoid valve (9)**

Remove solenoid valve.

Remove O-rings.

Install new O-rings. Use vaseline to hold rings in position. Reinstall solenoid valve.

Torque: 10–16 Nm (7.5–12 ft.lb)

**Replacement of seals with transmission removed**

D12

As a preventive maintenance measure, all seals should be inspected and replaced if necessary when the transmission has been removed from the car. See operations R1–R5 and S1–S29 for removal procedures.

D13

**Seal, oil pump**

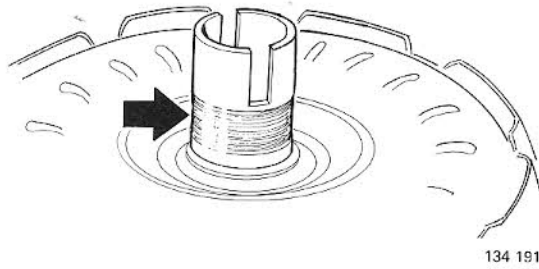
Remove seal using extractor 5069. Install new seal using drift 5117.

D14

**Bushing, oil pump**

**Check position and condition of bushing**

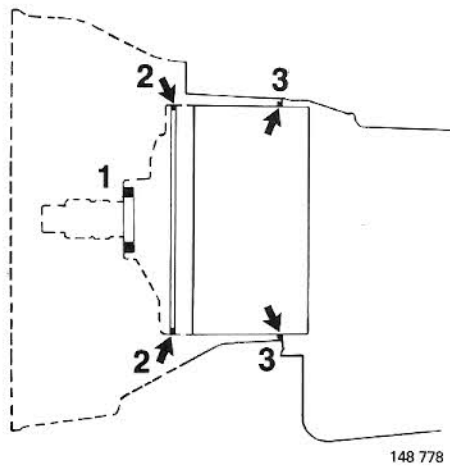
If bushing has been displaced outwards, it will obstruct a drain passage in the pump, causing leakage. Pump must be replaced if this fault has occurred or if bushing is damaged.



### D15 Inspect torque converter throat for damage

Throat is supported in bushing in oil pump. If throat is damaged, torque converter must be replaced.

- 1 Seal, oil pump
- 2 O-ring, oil pump
- 3 O-ring, overdrive



### D16 O-rings, oil pump and torque converter housing

**Remove oil pump.** Use extractor 5071. Install guide pins 5241 to hold overdrive housing in position.

**Remove torque converter housing.**

Removal is facilitated by employing a twisting-pulling action. Ensure that overdrive housing is not removed with converter housing.

D17

### Remove O-rings

### Install new O-rings

Lubricate O-rings with ATF fluid.

**Models to 1983 inclusive:** ATF fluid, type F or G

**Models from 1984 on:** ATF fluid, type Dexron II D

Lubricate mating surfaces between torque converter housing and overdrive housing with petroleum jelly. Install torque converter housing. Tighten bolts.

Torques:

4 × M10: **35 Nm** (26 ft.lb)

2 × M12: **60 Nm** (44 ft.lb)

Remove guide pins 5241 and reinstall oil pump. Tighten bolts.

Torque: **22 Nm** (16 ft.lb)

## Line pressure, measurement

Special tools: 2531, 5074

E1

### Check fluid level

See operations A1–A4.

E2

### Connect pressure gauge

Attach pressure gauge 2531 to side window. Remove front plug on gearbox and install connector 5074. Connect tube to connector.

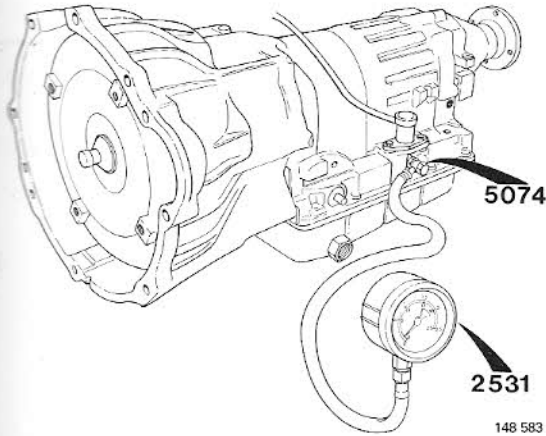
E3

### Start engine and allow to idle with gear selector in position N

Check idling speed.

E4

### Depress brake pedal. Place gear selector in position D and read line pressure



Engine	Transmission	Idling, position D Pressure, MPa
B 19/200 E	AW 70	0.35–0.44
B 23 E	AW 71	–”–
B 230 K –1986	AW 71	–”–
B 200 K, B 230 F	AW 70	0.46–0.54
B 23/230 FT	AW 71	–”–
B 230 A	AW 71	–”–
B 230 K 1987–	AW 71	–”–
B 28 A, E, F	AW 71	–”–
B 234 F	AW 72 L	0.44–0.52
B 280	AW 71	0.51

E5

### Move gear selector to position R and read line pressure

Engine	Transmission	Idling, position R Pressure, MPa
B 19/200 E	AW 70	0.50–0.64
B 23 E	AW 71	—”—
B 230 K –1986	AW 71	—”—
B 200 K, B 230 F	AW 70	0.70–0.82
B 23/230 FT	AW 71	—”—
B 230 A	AW 71	—”—
B 230 K 1987–	AW 71	—”—
B 28 A, E, F	AW 71	—”—
B 234 F	AW 72 L	0.64–0.76
B 280	AW 71	0.77

## Deviations

E6

### Line pressure too high:

Is kickdown cable correctly adjusted?

No: Adjust cable. See operations J1–J10.

Yes: Check valves as described below.

### Primary regulator valve

Rev engine. If pressure varies in proportion to engine speed, valve is stuck and normal pressure control is inoperable. Dismantle control system.

### Throttle valve

Idle engine with gear selector in position N. Operate throttle valve by hand (without moving throttle). If line pressure does not increase, throttle valve is sticking. Dismantle control system.

### Shift valves 1–2 and 2–3

### Cutback valve

E7

### Pressure correct but falls after a couple of seconds

Secondary regulator valve may be faulty or earlier type of valve may be fitted. Replace with later type.

E8

### No pressure (no rearward propulsion)

Faulty or blocked primary regulator valve, shift valve 2–3 or rear brake B3 control valve. Clean and inspect.

Faulty operation of accumulator piston C2.

Undo centre support unit mounting bolts. For tightening torques, see Service Manual, Section 4 (43) Reconditioning, 'Complete reassembly', operation AZ22.

E9

**Line pressure too low**

This may be due to sticky primary regulator or throttle valve. Check as described in operation E6 above.

If inspection reveals that valves are not sticking, low pressure may be due to faulty relief valve or oil pump. (In this case, pump will usually be noisy.) Alternately, oil strainer may be blocked.

Low line pressure may also be due to a faulty accumulator piston.

**Stall speed, measurement**

E10

**Measure stall speed when measuring line pressure**

Check provides information mainly on condition of torque converter and transmission clutches.

In order for test to give correct results:

- Engine must deliver full power.
- Line pressure must be correct.
- Transmission fluid level and operating temperature must be correct.

**Note:** Never carry out stall speed check if line pressure is too low.

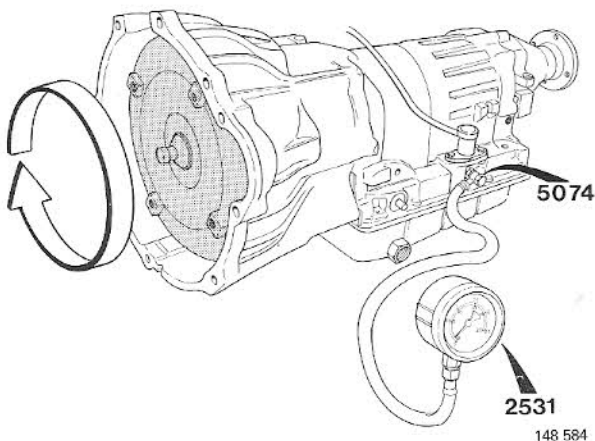
E11

**Procedure**

Connect a rev counter so that it can be read from the driver's seat. Air conditioning (AC) system must be switched off. Start engine. Apply handbrake and press brake pedal hard with left foot. Move gear selector to position D and press accelerator to floor.

**Carry out for maximum of 5 seconds.**

Read maximum speed and line pressure, and compare with values on following page.



Allow engine to idle for approx. 30 seconds with selector in position N. Apply handbrake and press brake pedal hard with left foot. Move gear selector to position R and repeat test.

Engine	Transmission	Normal stall speed <sup>1)</sup>		Line pressure at stall MPa	
		r/s	(r/min)	Position D	Position R
B 19 E	AW 70	36.7	(2200)	1.00–1.20	1.37–1.70
B 23 E	AW 71	35.0	(2100)	"	"
B 23 FT	AW 71	33.3– 41.7	(2000– 2500)	"	"
B 28 A	AW 71	35.0	(2100)	"	"
B 28 E	AW 71	35.0	(2100)	"	"
B 28 F	AW 71	33.0	(2000)	"	"
B 200 K	AW 70	38.0	(2300)	"	"
B 200 E	AW 70	35.0	(2100)	"	"
B 230 A	AW 71	35.0	(2100)	"	"
B 230 K –1986	AW 71	42.0	(2500)	"	"
B 230 K 1987–	AW 71	42.0	(2500)	"	"
B 230 F <sup>3)</sup>	AW 70	33.0	(2000)	"	"
B 230 F <sup>4)</sup>	AW 70	33.0	(2000)	"	"
	AW 70	33.0	(2000)	"	"
B 234 F <sup>5)</sup>	AW 72	30.0	(1800)	1.12–1.32	1.55–1.95
B 230 FT	AW 71	33.3– 45.0	(2000– 2700)	"	"
B 280 E Nordic	AW 71	35	(2100) <sup>6)</sup>	1.15	1.74
Others	AW 71	35	(2100)	"	"
B 280 F	AW 71	35	(2100)	"	"
	AW 71	35	(2100)	"	"

<sup>1)</sup> At sea level. Speed is reduced by 2 r/s (120 r/min) per 1000 m above sea level.

<sup>2)</sup> Initial/final speed.

<sup>3)</sup> USA/Canada, 5-door, and Japan, Australia 1988.

<sup>4)</sup> USA/Canada/Japan/Australia 1 208 604, others 1 208 652.

<sup>5)</sup> USA/Canada 1 208 637, Europe 1 208 638 (with kickdown inhibitor).

<sup>6)</sup> With kickdown inhibitor.

## Deviations:

E13

### High stall speed:

300 r/min higher than normal:

1. Incorrect fluid level. Check level. See operations A1–A4.
2. Blocked oil strainer. Remove pump and clean strainer.

300 r/min higher than normal with screeching clutch or brake:

Slipping clutch or brake. Dismantle gearbox. Check primarily:

- for gear position R: Clutch C2 and brake B3
- for gear positions D, 1, 2: Clutch C1

E14

### Low stall speed:

300 r/min lower than normal:

Check that engine is delivering full power.

600 r/min lower than normal with poor acceleration from rest, but normal acceleration over approx. 70 km/h:

Faulty torque converter. Replace.

Noise: See fault-tracing procedures AA7–AA12.

## Governor pressure, measurement

Special tool: 5114

Since governor pressure is a function of line pressure, incorrect line pressure will also cause incorrect governor pressure.

F1

### Measure line pressure before measuring governor pressure

See operations E1–E14.

F2

### Check fluid level

See operations A1–A4.

F3

### Connect pressure gauge

Mount pressure gauge 5114 on side window.

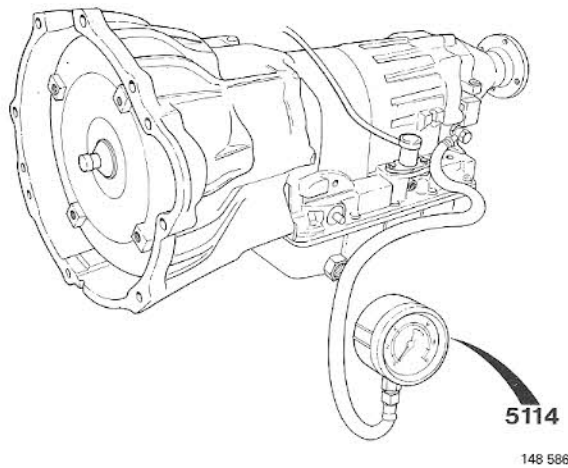
Remove rear plug and mount connector.

Connect tube to connector. Check that governor pressure is zero when engine is idling with gear selector in positions D and R with car at rest.

F4

### Test drive car in position D and read governor pressure

Compare readings with values in table below.



## Governor pressure

Final drive ratio							
3.54:1		3.73:1		3.91:1		4.10:1	
Speed	Pressure	Speed	Pressure	Speed	Pressure	Speed	Pressure
21 mph (34 km/h)	0.11–0.17 MPa	19 mph	0.09–0.15 MPa	18 mph	0.09–0.15 MPa	17 mph 16 mph*	0.09–0.15 MPa
34 mph (55 km/h)	0.17–0.23 MPa	34 mph	0.16–0.22 MPa	33 mph	0.16–0.22 MPa	45 mph 28 mph*	0.16–0.22 MPa
68 mph (110 km/h)	0.38–0.50 MPa	67 mph	0.41–0.53 MPa	164 mph	0.41–0.53 MPa	61 mph 95 km/h*	0.41–0.53 MPa

\* Applies to AW 72L.

## Deviations

F5

### High governor pressure

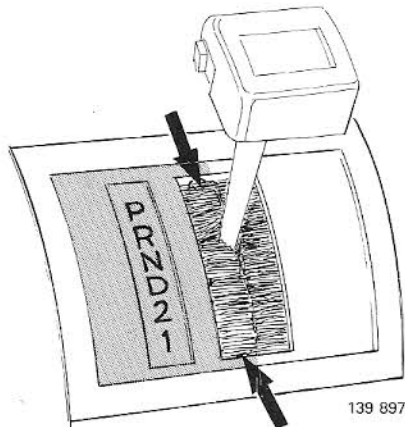
Governor sticking. Remove and inspect.  
See operations O1–O6.

F6

### Low governor pressure

Governor leaking or sticking.  
Leakage at governor oil passage cover plate.  
Poor seal between governor and output shaft.  
Remove and inspect governor. See operations O1–O6.

## Start inhibitor/reversing light switch, replacement



**Remove ashtray and centre console panel**

G1

**1982-84**

**Remove left-hand section of selector lever casing with brush attached**

G2

Remove two screws under brush.

**Remove start inhibitor/reversing light switch from segment**

G3

**Open connector and lift off switch**

**Install new switch**

G4

Rejoin connector. Ensure that projection on gear selector lever is seated in slot in switch.

Remember to reinstall light prism (A).

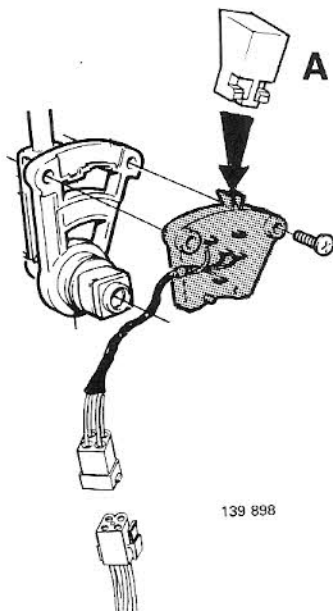
**Install left-hand section of selector lever casing with brush**

G5

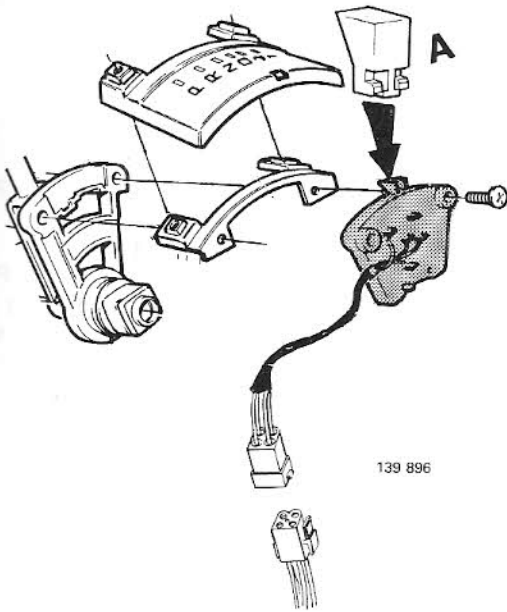
Press rubber seal into position all round.

**Install panel and ashtray**

G6



1985—



G7

Remove retainer with gear position markings

G8

Remove start inhibitor/reversing light switch  
Open connector and lift off switch

G9

**Install new switch**

Rejoin connector.

Ensure that projection on gear selector lever is seated on slot in switch.

Remember to reinstall light prism (A).

G10

**Install panel and ashtray**

## Gear selector mechanism, inspection/adjustment

### Service inspection

H1

- Engine should start only in gear selector positions P and N.
- Reversing light should operate in position R.
- Gear selector lever should be vertical in position P.
- Tangible clearance should be felt when moving from position D to N. Clearance should be less than or equal to that when moving from position 2 to 1.

### Basic adjustment

H2

Move gear selector to position P

H3

Undo control rod and reaction strut locknuts

H4

Check that selector link on gearbox is in position P (rearmost position)

Turn output shaft on gearbox until movement is blocked.

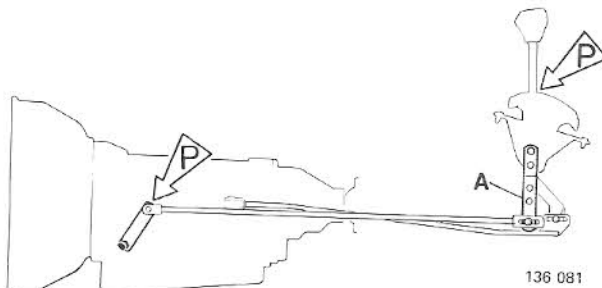
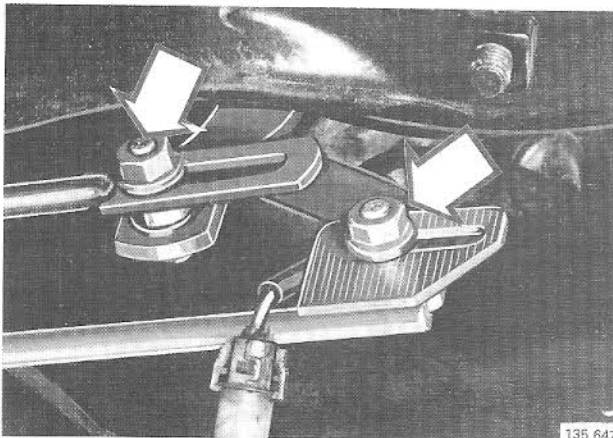
H5

Adjust gear lever arm (A) to vertical (or slightly forward) position and tighten locknut

Gear selector lever may bump against instrument panel if arm is adjusted too far back.

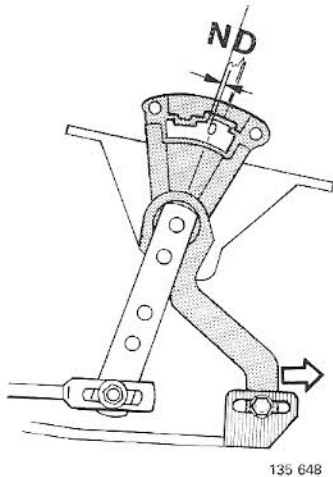
H6

Press reaction arm backwards until slight resistance is felt. Tighten locknut at reduced torque of approx. 5 Nm (3.5 ft.lb).



## Adjustment of clearance

H7



Check that tangible clearance is felt when moving from position D to N and that clearance is equal to that when moving from position 2 to 1

Tighten locknut if clearance is correct.

Torque: 17–23 Nm (12.5–17 ft.lb).

**If clearance is incorrect, adjust as follows:**

**If lever is stiff in position D:**

- Adjust reaction arm approx. 2 mm towards rear.

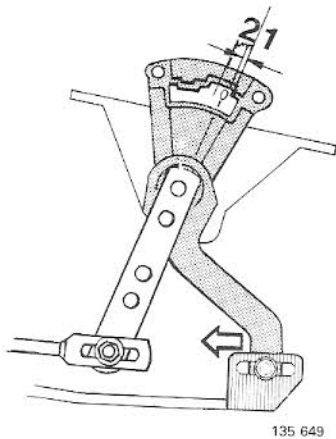
**If lever is stiff in position 2:**

- Adjust reaction arm approx. 3 mm towards front.

Distance between two marks (introduced on models from 1983 on) on reaction strut rear mounting is 2.5 mm. Tighten locknut.

Torque: 17–23 Nm (12.5–17 ft.lb).

H8

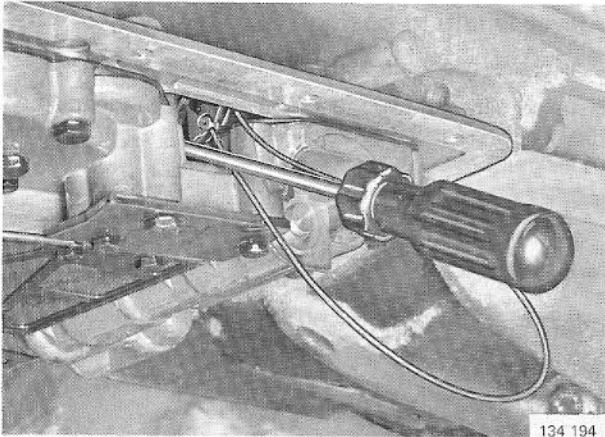
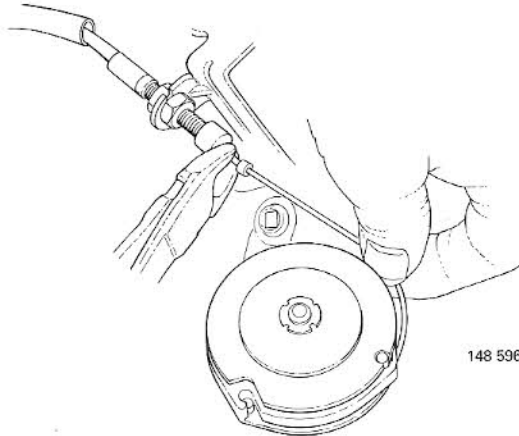


**After adjustment, check:**

- that engine starts only in positions P and N
- that reversing light operates in position R

**Note:** Reversing light may not operate in position R on some models. In this event, reduce the clearance between positions D and N by adjusting the reaction arm slightly towards the front.

## Kickdown cable, replacement/adjustment



J1

### Disconnect cable from throttle pulley

Pull cable slightly out of sleeve in engine compartment.  
Cut off cable between stop and cable tensioner.  
Remove cut section from throttle pulley.  
Remove cable tensioner and sleeve from mounting bracket.

J2

### Drain transmission fluid by removing drain plug

On units without drain plug, disconnect filler tube from sump.  
Remove sump and gasket.

**Caution!** Fluid may be extremely hot if car has recently been driven.

J3

### Disconnect cable from gearbox

Use snipe-nose pliers to pull out a loop of cable and jam throttle cam with a screwdriver.

### Disconnect cable from throttle cam

Clean outside of gearbox around cable sleeve and remove sleeve.

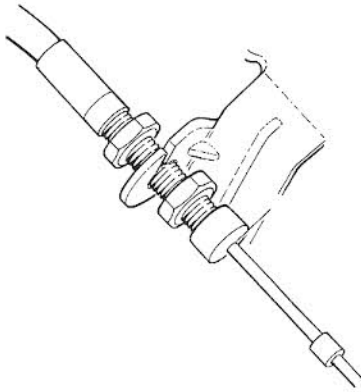
## Installation of new cable

J4

### Pull length of cable out of sleeve and insert in gearbox

Secure sleeve in position.  
Jam throttle cam with screwdriver and attach cable.  
Release throttle cam. Pull other end of cable and ensure that cable is seated in cam groove.

J5

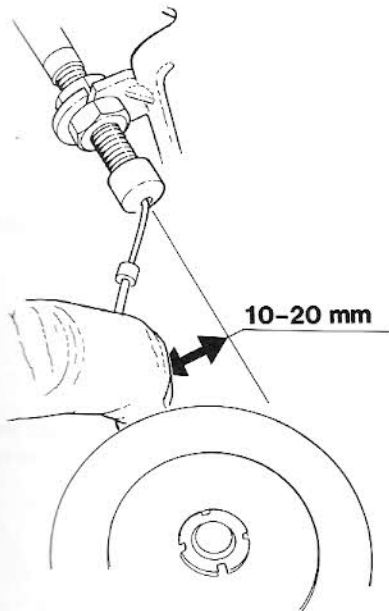


148 594

**Run cable and sleeve into engine compartment and attach sleeve loosely to throttle pulley mounting bracket**

**Note:** Check that throttle is correctly adjusted. If adjustment is required, see procedure for engine in question.

J6



148 598

**Attach cable to throttle pulley and adjust sleeve by means of cable tensioner**

**Check that cable is seated in throttle cam groove**

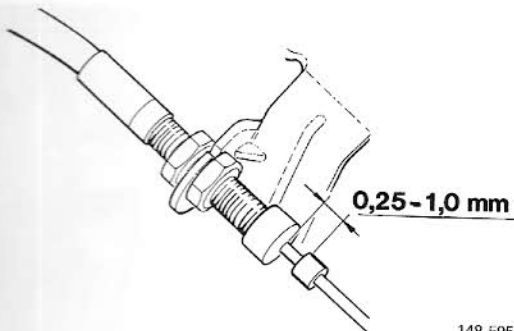
Pull out 10–20 mm of cable and release quickly. Metallic 'click' should be heard as throttle cam reaches limit position.

Tension cable sufficiently to eliminate 'click'. Then, relieve tension just enough for noise to return.

Repeat first step (pulling out cable 10–20 mm etc.) at regular intervals during adjustment.

Tighten cable tensioner nuts.

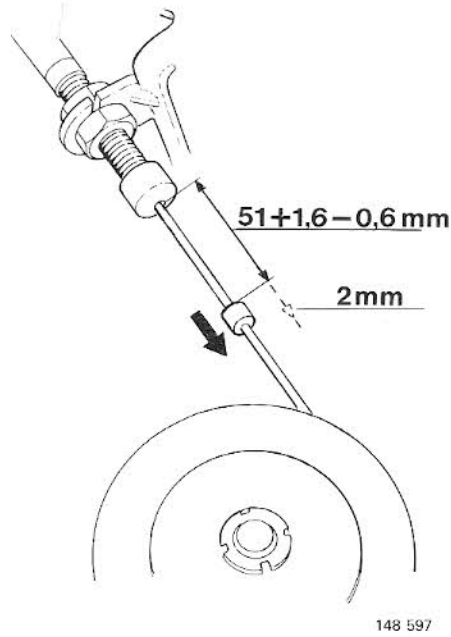
J7



148 595

**Attach stop to cable**

Clamp stop 0.25–1.00 mm from end of cable tensioner. Use flat-nose or adjustable pliers.



J8

#### Press accelerator to floor

With throttle pulley seated against its stop, it should be possible to withdraw kickdown cable by about 2 mm more than dimension shown in illustration.

**Note:** Never turn throttle pulley by hand when carrying out this check.

J9

#### Check that cable is seated in throttle cam groove

J10

#### Remount oil sump and filler tube

Ensure that sump and particle magnet(s) are well cleaned and that magnet(s) are positioned immediately under oil strainer.

Use new sump gasket.

Torque, oil sump: **4–5 Nm** (3–3.5 ft.lb)

Torque, filler tube: **80–100 Nm** (59–74 ft.lb)

J11

#### Fill transmission with fluid

Adjust level as described in operations A1–A3.

**Note:** Use correct grade of fluid. See operation A3.

## Control system, removal/installation (replacement)

Special tool: 5076

### Removal

K1

Release throttle cable from throttle pulley

K2

Drain transmission fluid

Disconnect filler tube from sump.

**Caution!** Fluid may be extremely hot if car has recently been driven.

K3

Remove oil sump, particle magnet(s) and gasket  
Carefully prise out oil pipes (two) with screwdriver

(Note: Three pipes in transmission with kickdown inhibitor).

K4

Remove oil strainer, intermediate piece and gaskets

K5

Loosen control system

Remove all screws except that behind gear selector valve spring (arrowed in illustration).

K6

Attach retainer 5076

Loosen remaining screw sufficiently to allow accumulator piston retainer to be placed in position.

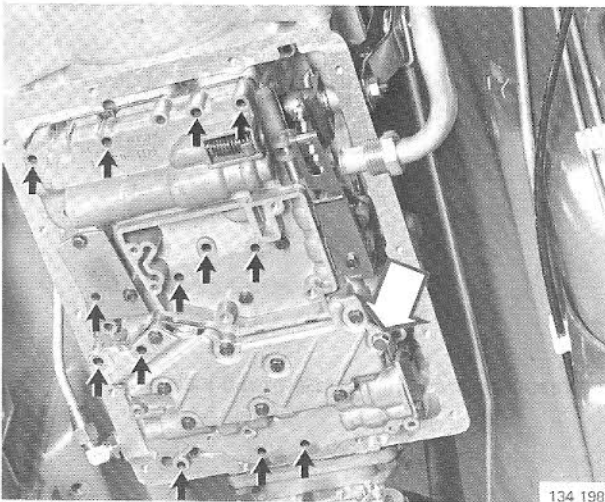
K7

Remove control system

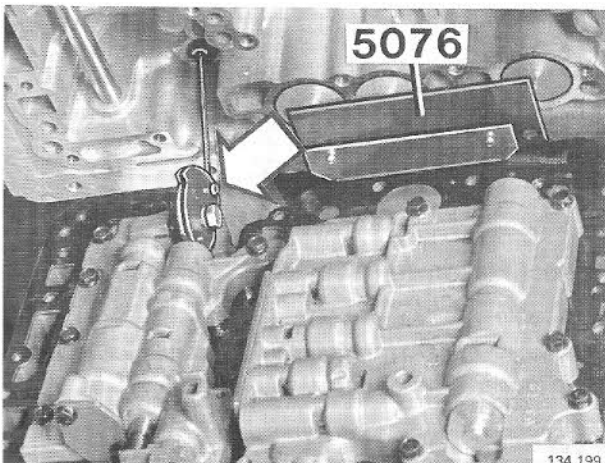
Remove last screw. Release throttle cable from throttle cam and remove control system.

See operations N1–N9 if replacing accumulator pistons.

See operations M1–M16 if replacing gear selector mechanism and parking pawl.



134 198

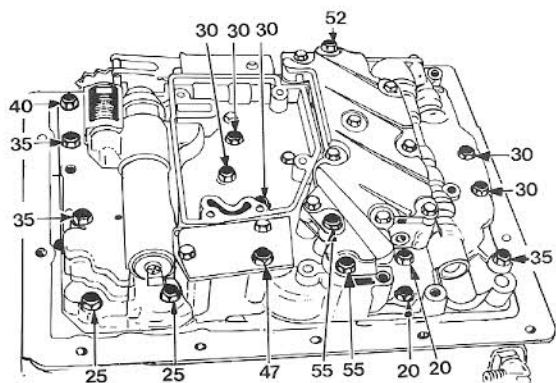


134 199

K8

### Replacement of complete control system

Existing system must be replaced by type specified in replacement schedule (see 'Specifications', page 40) if complete system is to be replaced.



134 201

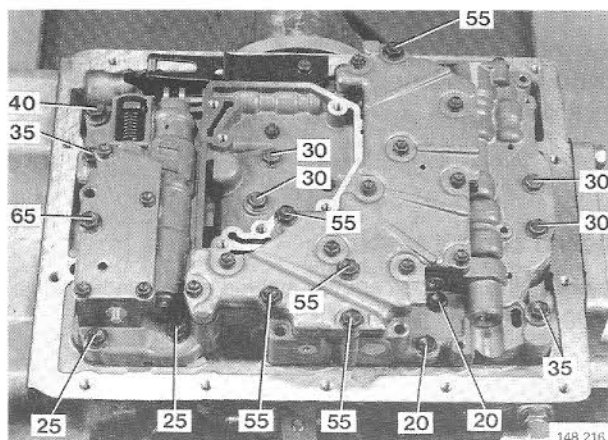
### Installation

K9

**Connect throttle cable to throttle cam. Mount control system in position and insert screws loosely**

**Ensure that gear selector cam spigot is seated in selector valve groove**

Illustration shows control system without lock-up.



148 216

Illustration shows control system with lock-up.

K10

**Remove retainer 5076 and tighten screws. Tighten alternately**

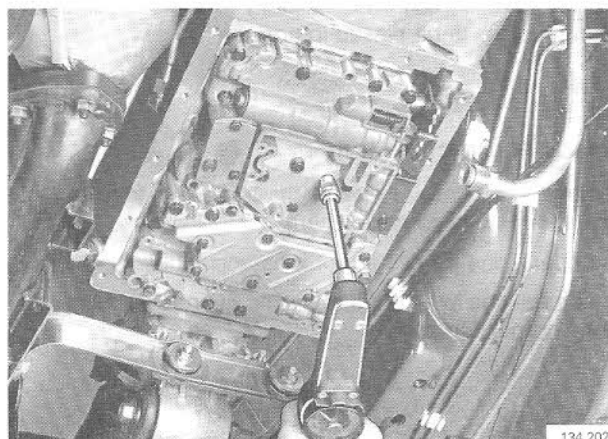
Torque: 8–12 Nm (6–9 ft.lb)

K11

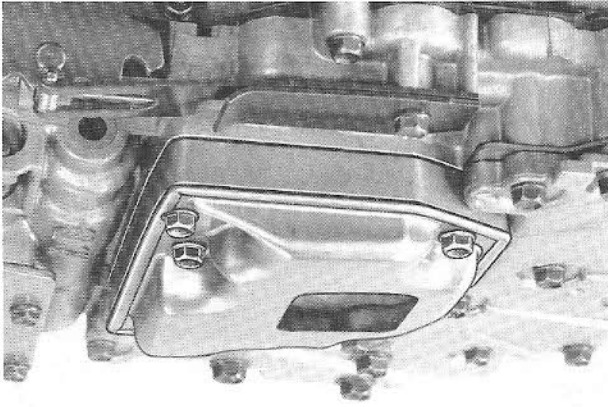
**Connect kickdown cable to throttle pulley**

Adjust cable.

See operations J1–J10 regarding adjustment or replacement of cable.



134 202



148 660

K12

**Install oil strainer and tighten screws**

Torque: **5–6 Nm** (3.5–4.5 ft.lb)

K13

**Install particle magnet(s)**

Magnets are installed under strainer in sump.

**Install control system oil pipes**

**Note:** Three pipes in transmission with kickdown inhibitor.

K14

**Install oil sump with new gasket**

Torque: **4–5 Nm** (3–3.5 ft.lb)

K15

**Install fluid filler tube**

Torque: **80–100 Nm** (59–74 ft.lb)

K16

**Fill transmission with fluid**

**Models to 1983 inclusive:** ATF fluid, type F or G

**Models from 1984 on:** ATF fluid, type Dexron II D

See operation A3 regarding quantities.

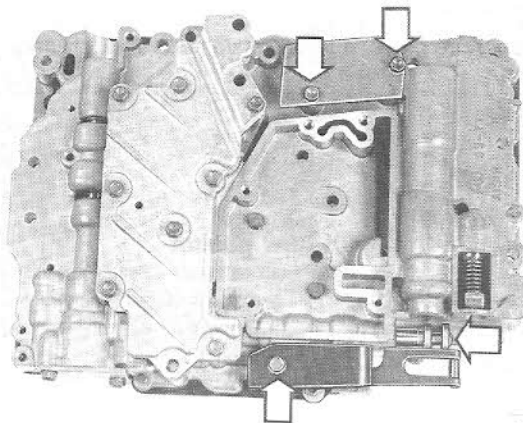
## Delayed engagement – replacement of upper front valve body, AW 70/71

Delayed engagement and/or loss of propulsion after driving approx. 100 metres after starting from cold is usually due to low transmission fluid level. If the problem persists even when the level is correct and the transmission is cold, the upper front valve body in the control system must be replaced.

The new valve body is equipped with a valve which vents air in the system to the gearbox housing rather than to the pump.

The illustrations which accompany the description show control systems with and without lock-up. The method is applicable to both types.

Component	P/N
Upper front valve body	1 340 084-1
Ball valve	1 340 085-8
Gasket set	274 029-8



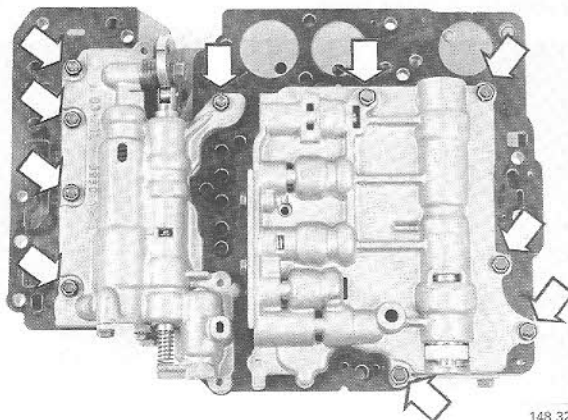
148 322

### Dismantling

#### Separate control system from gearbox

See operations K1–K7.

L1



148 323

#### Remove:

- locking spring and retainer
- gear selector valve
- cover plate
- gasket

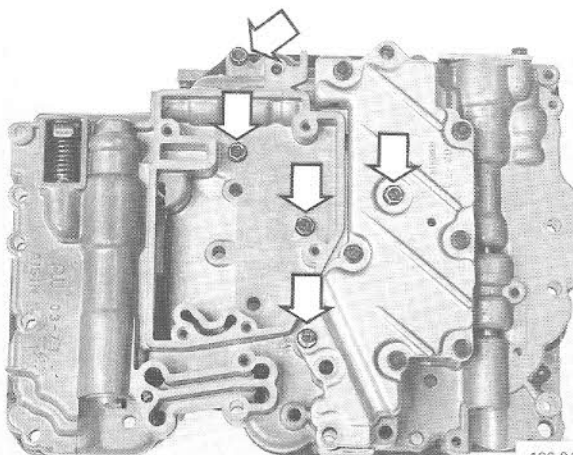
See illustration above.

L2

#### Remove upper front and upper rear valve body screws

Remove 10 screws.

L3



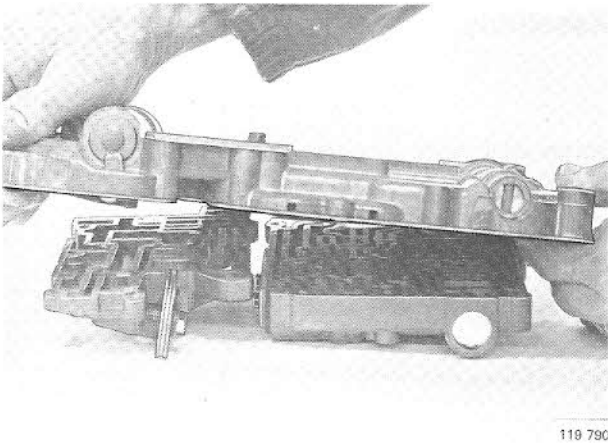
136 245

#### Turn control system upside down

#### Remove screws (five) in underside

L4

L5



119 790

L6

**Remove lower valve body**

Move valve body carefully aside. Lift off and place with gasket facing upwards.

Hold gasket and separator plate to prevent balls and springs from falling out of body.

L7

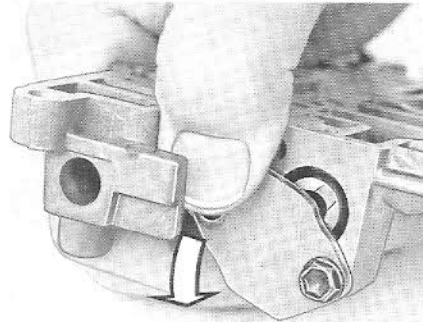
**Dismantle upper front valve body**

L8

**Removal of secondary regulator valve (3A)**

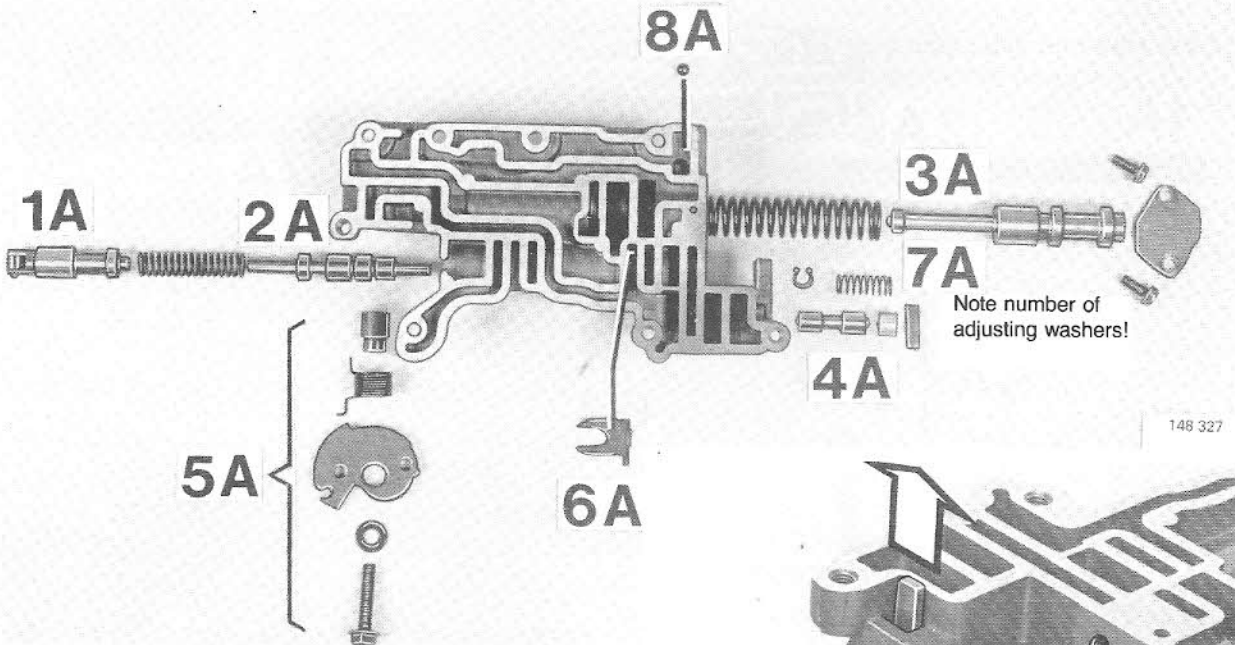
Remove one screw. Move cover aside to expose valve.

**Caution:** Strong spring pressure.

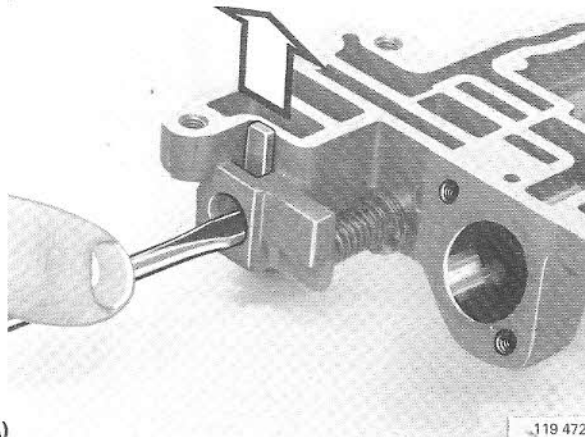


**Components**

- |                              |                                                                         |
|------------------------------|-------------------------------------------------------------------------|
| 1A Kickdown valve            | 7A Throttle valve spring<br>(Adjusting washers may be fitted)           |
| 2A Throttle valve            |                                                                         |
| 3A Secondary regulator valve | 8A Rubber ball, dia. 5.5 mm<br>(only in control system without lock-up) |
| 4A Cutback valve             |                                                                         |
| 5A Throttle cam              |                                                                         |
| 6A Adjusting washers         |                                                                         |



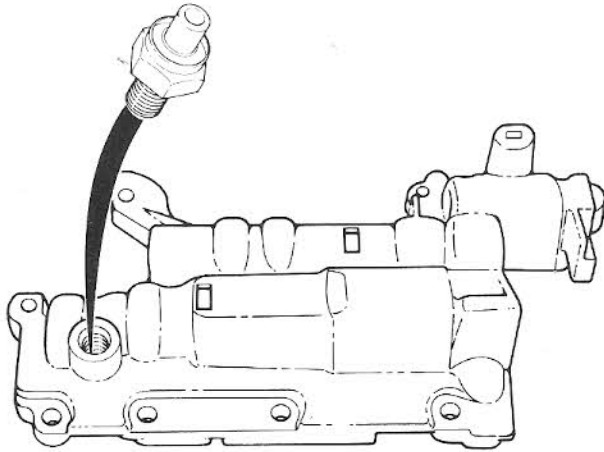
148 327



119 472

**Removal of cutback valve (4A)**

Delayed engagement



139 834

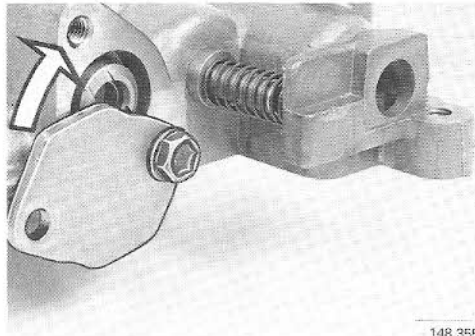
Assembly

Screw ball valve into new valve body

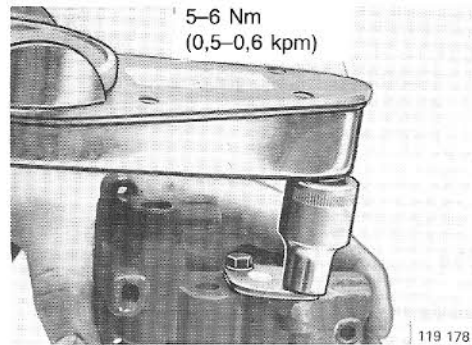
L9

Install components in new valve body

L10

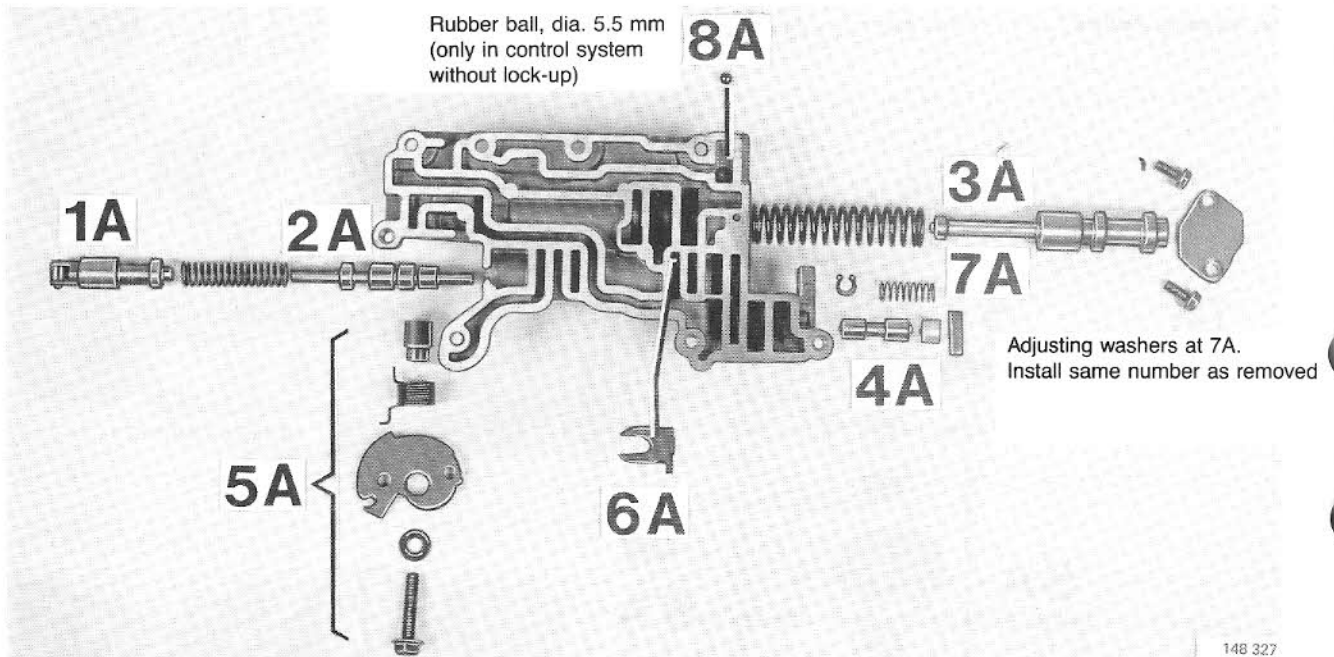


148 355

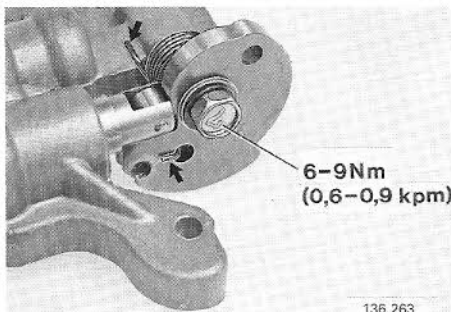


5-6 Nm  
(0,5-0,6 kpm)

119 178

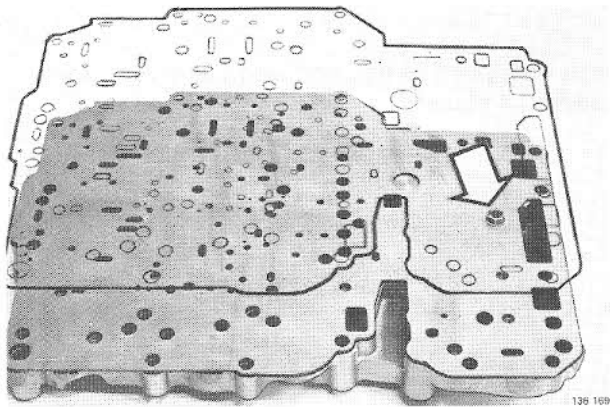


148 327



6-9Nm  
(0,6-0,9 kpm)

136 263



L11

**Gaskets**

**Important!** Upper and lower gaskets are dissimilar. Ensure that each gasket is positioned and orientated correctly.

L12

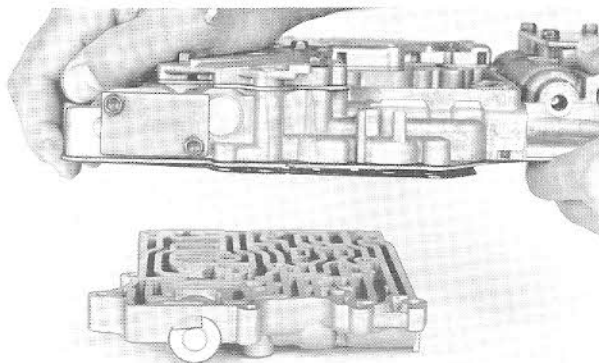
**Place lower gasket and separator plate on top of lower valve body**

Check that balls, by-pass valve, spring and valve retainers are in position. Use new gasket, checking that it is identical to original. Attach separator plate loosely with one screw.

L13

**Place upper gasket on top of separator plate**

Use new gasket. Check that gasket is identical to original.



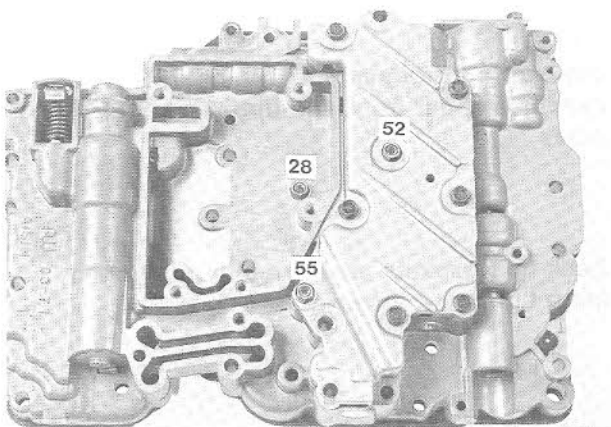
L14

**Check that all balls and valve retainers are in position in upper rear valve body**

L15

**Place upper valve body on top of lower valve body**

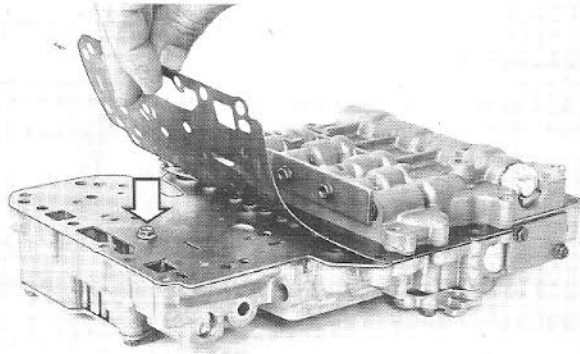
Ensure that gasket and holes correspond.



L16

**Insert upper rear valve body screws**

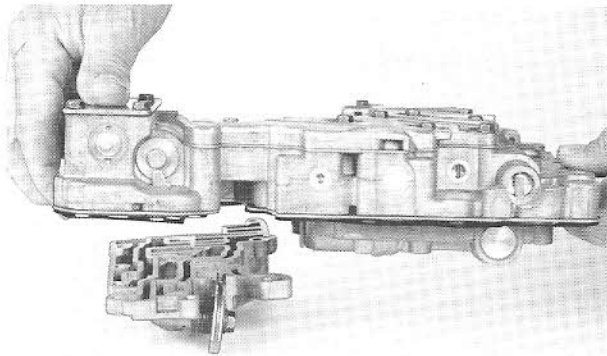
Insert three screws.



148 385

L17

**Turn valve body over and remove screw from separator plate**



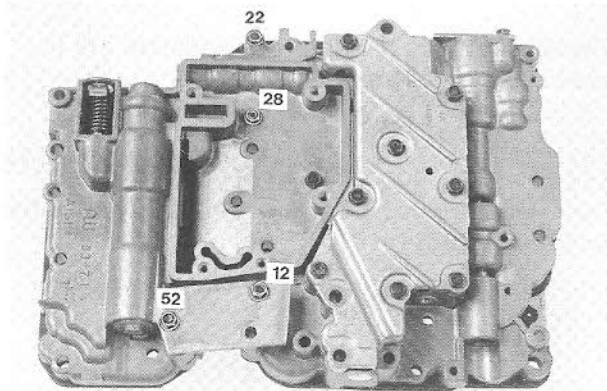
148 387

L18

**Place lower valve body on top of upper front valve body**

Check that ball and throttle valve retainer are in position in upper front valve body.

Ensure that gasket and holes correspond.

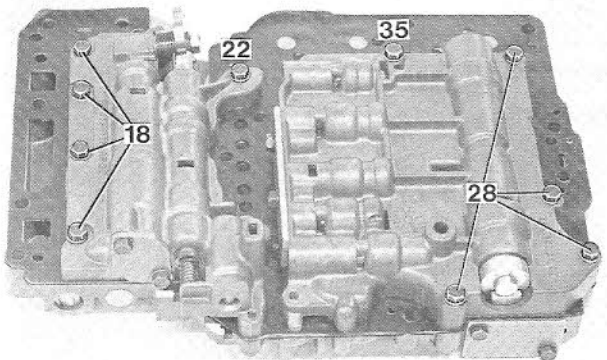


136 280

L19

**Insert screws in upper front valve body**

Also place cover plate in position (4 screws).



119 792

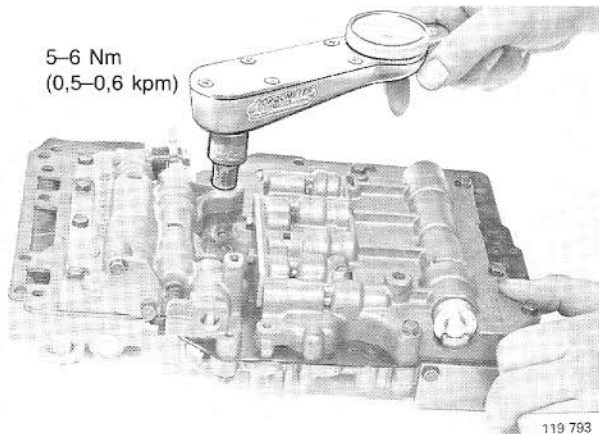
L20

**Turn over control system and insert five screws in each of upper front and upper rear valve bodies**

L21

**Check that gaskets are correctly positioned before tightening screws**

5–6 Nm  
(0,5–0,6 kpm)



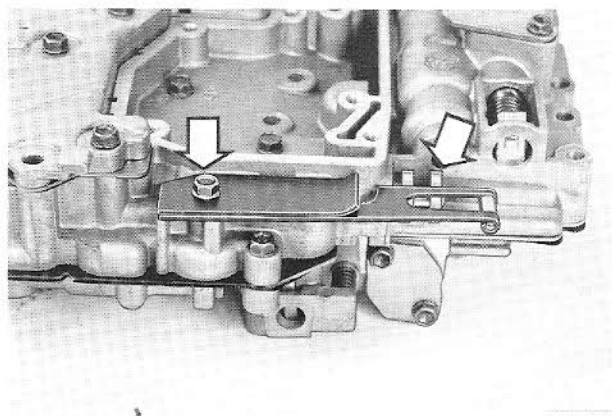
119 793

### Tighten valve body screws

Torque: **5–6 Nm** (3.5–4.5 ft.lb)

Tighten from both sides.

L22



148 390

### Install gear selector valve

L23

### Install locking spring and retainer

Tighten screws.

Torque: **5–6 Nm** (3.5–4.5 ft.lb)

L24

L25

### Mount control system on gearbox

Use new sump gasket.

See operations K9–K16.

L26

### If complete control system is to be replaced:

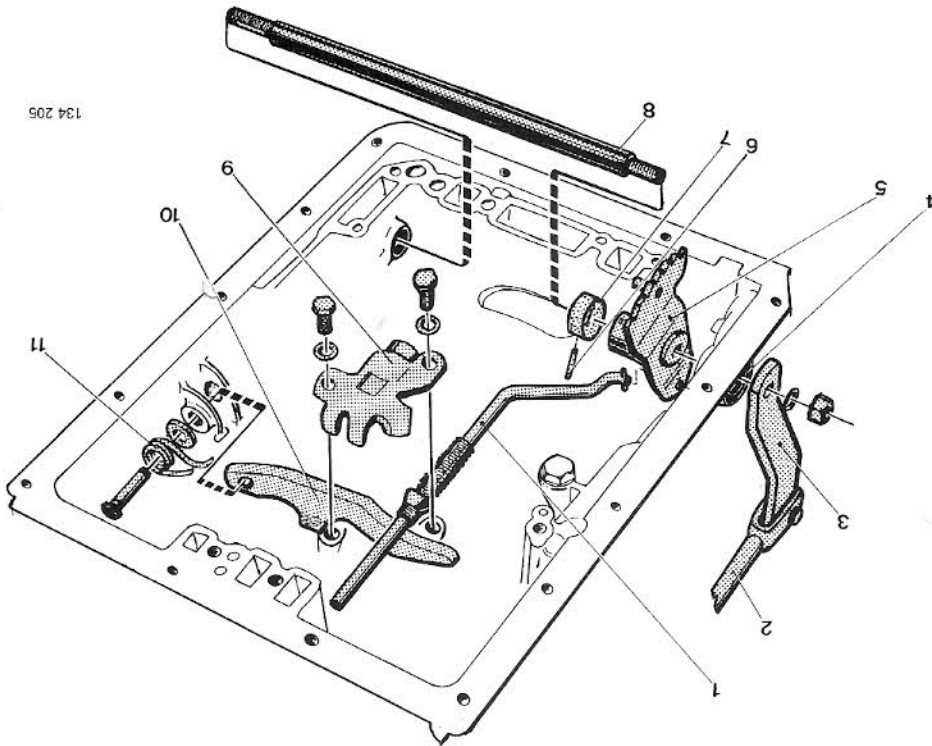
See 'Specifications' regarding identification of transmission.

See replacement schedule on page 40 of 'Specifications' for correct part number of new control system.

## Gear selector mechanism, replacement

Special tools: 5076, 5118

- 1 Pushrod
- 2 Control rod
- 3 Selector link
- 4 Seal
- 5 Gear selector cam
- 6 Locking pin
- 7 Retaining ring
- 8 Gear selector shaft
- 9 Retaining plate
- 10 Parking pawl
- 11 Spring



**Remove control system**  
See operations K1-K7.

M2

**Remove parking pawl retaining plate and pushrod**

M3

**Disconnect control rod from selector link on gearbox**

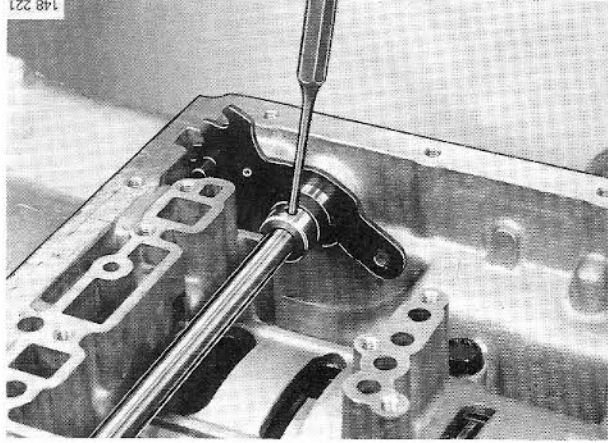
M4

**Remove link from gear selector shaft**

M5

**Remove locking pin from gear selector cam**

Tap retaining ring to one side and knock out pin with drift.



M6

**Press out gear selector shaft**

M7

**Remove shaft seals**

Use screwdriver.

M8

**Clean and inspect components**

Parking pawl should also be inspected for wear when replacing gear selector mechanism. (Parking pawl spring is installed as shown in exploded view on page 90.)

M9

**Install new selector shaft seals**

Use drift 5118 and long screwdriver as lever.

M10

**Install gear selector shaft and cam**

Always use new locking pin and retaining ring. Tap retaining ring into position over pin. Lock ring by punching into recess beside pin.

M11

**Insert parking pawl pushrod in selector cam**

M12

**Support parking pawl with pushrod and install retaining plate (see picture below)**

Torque: 6–9 Nm (4.5–6.5 ft.lb)

M13

**Mount selector link on gear selector shaft**

Torque: 14 Nm (10 ft.lb)

M14

**Connect control rod to selector link**

M15

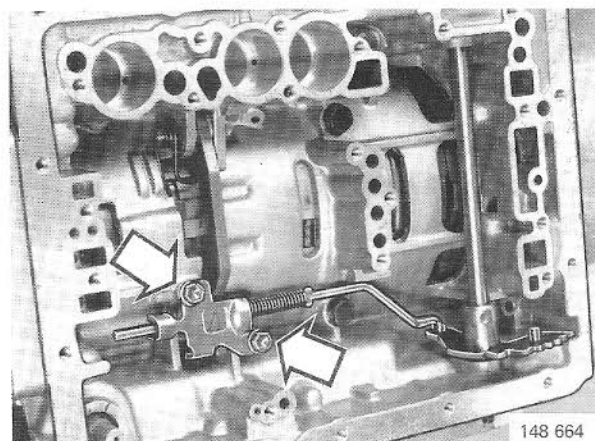
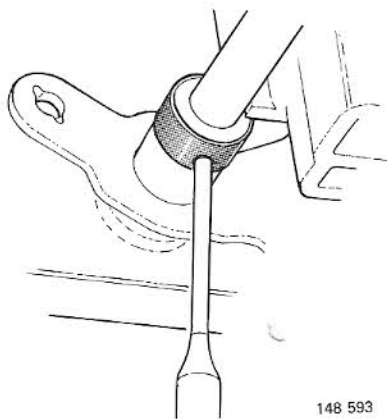
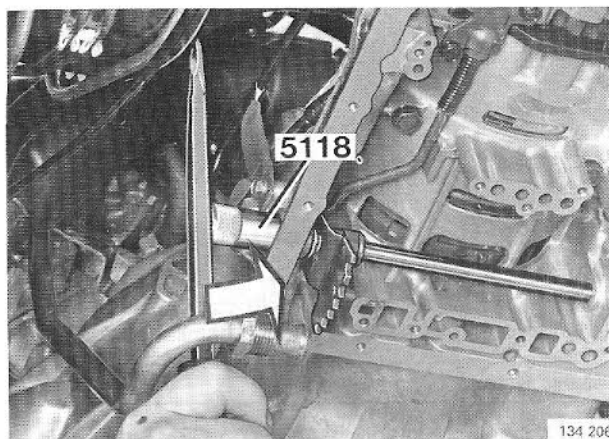
**Mount control system in position**

See operations K9–K16.

M16

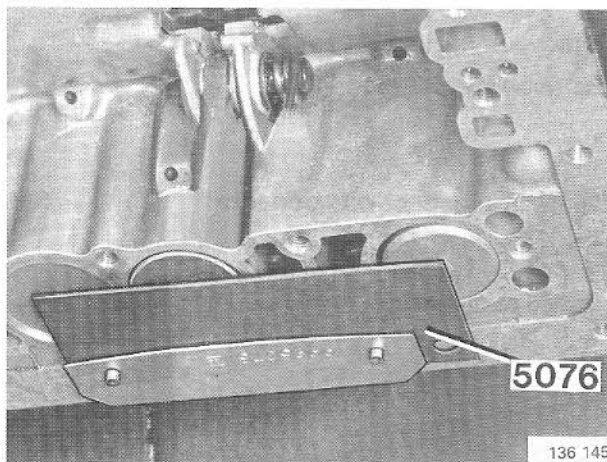
**Check operation of mechanism**

See operations H1–H8.



## Accumulator pistons, replacement

Special tool: 5076



N1

### Remove control system

See operations K1–K7.

N2

### Remove retainer 5076

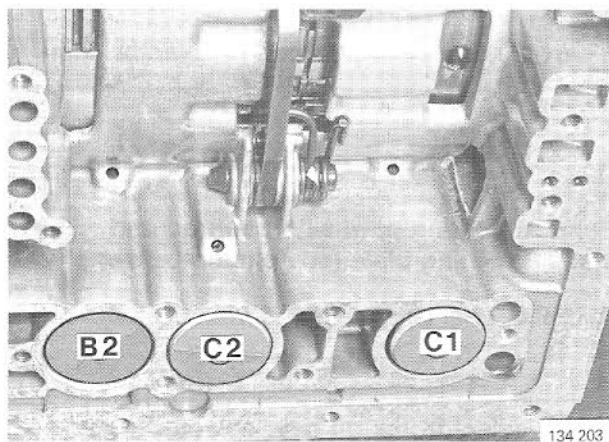
N3

### Remove accumulator pistons

If pistons are stuck, blow out with compressed air at reduced pressure of 100 kPa through holes underneath.

**Note:** Note location of springs.

AW 72 L has double springs in piston C2. Certain AW 70/71s have double springs in C2 or B2. AW 71 (1 208 534) and AW 71 L (1 208 417) have double springs in both B2 and C2. See 'Specifications, accumulator pistons and accumulator springs' on page 43.



N4

### Clean and inspect pistons

Replace sticky or worn pistons. See 'Specifications, control system'.

N5

### Install new O-rings

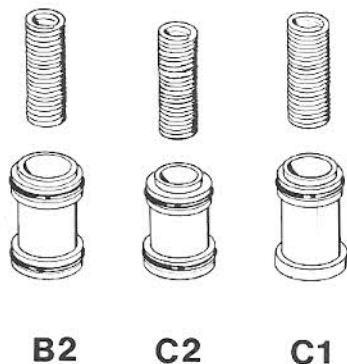
N6

### Install accumulator pistons and springs

**AW 70/71:**

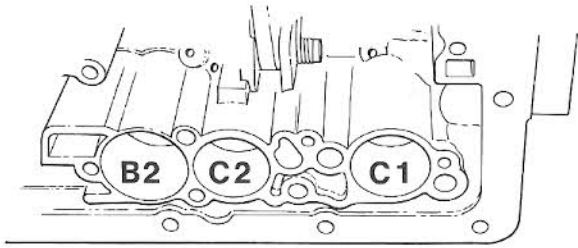
Install smallest piston in middle position (C2). The other two pistons are dissimilar and cannot be installed incorrectly. Install springs in accordance with notes made when dismantling.

### AW 70/71



148 310

N7



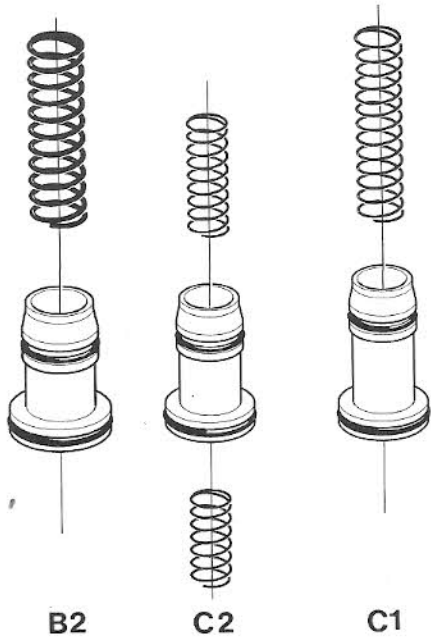
148 308

**AW 72 L:**

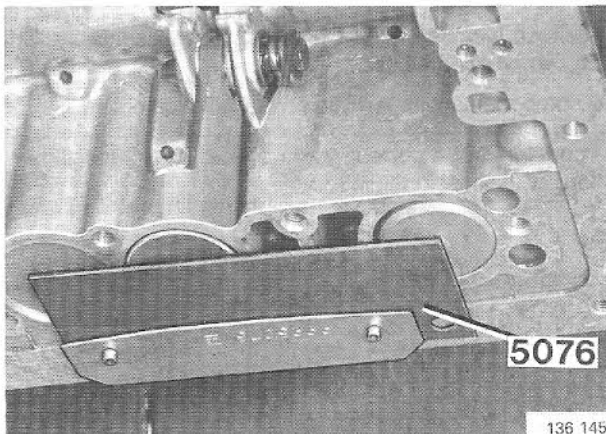
Install smallest piston with double springs in middle position (C2). The other two pistons are dissimilar and cannot be installed incorrectly.

Ensure that correct springs are used with correct pistons. See notes made when dismantling.

- B2: Yellow spring
- C2: Blue spring (inner)  
Orange spring (outer)
- C1: Black spring



148 309



136 145

**Install retainer 5076**

N8

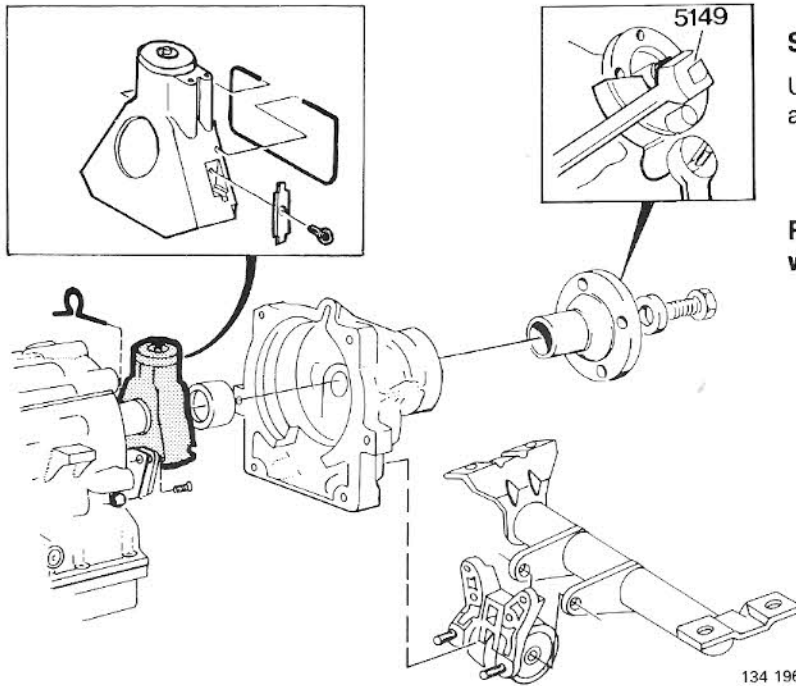
**Mount control system in position**

N9

See operations K9–K16.

## Governor, dismantling/assembly

Special tools: 5149, 5244



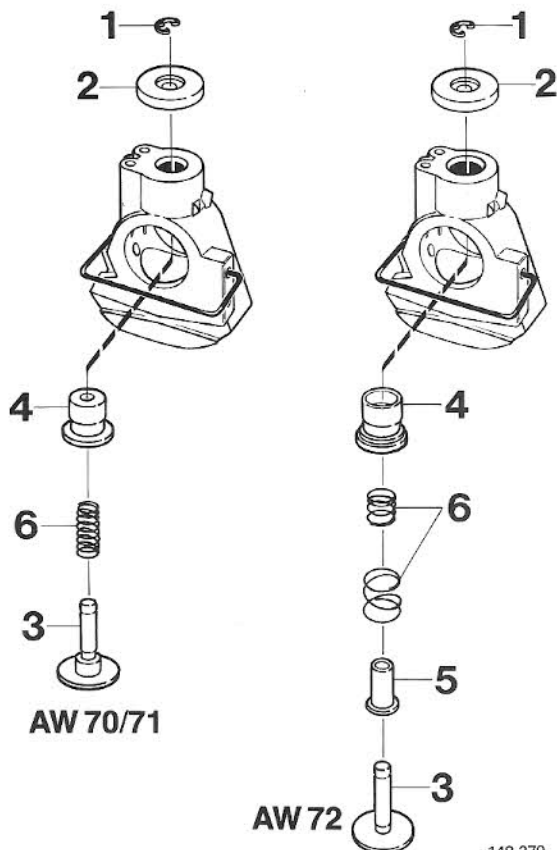
01

### Strip governor as illustrated

Use socket 5244 to disconnect propeller shaft and counterhold 5149 to remove drive flange.

02

### Remove spring, screw and retainer, and withdraw governor from shaft



03

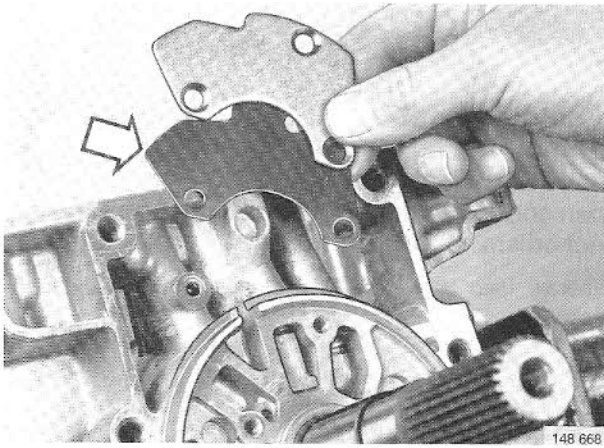
### Dismantle, clean and inspect governor components carefully

Use fresh cleaning fluid! Clean passages especially. Dry with compressed air.

Oil components with ATF fluid when reassembling.

**Important:** Use correct grade of fluid. See 'Specifications, transmission fluid'.

148 279



O4

**Replace gasket under oil passage cover plate**

O5

**Install governor in reverse order to dismantling**

Insert screw and retainer.

Torque: **4–5 Nm** (3–3.5 ft.lb)

Install spring. Remount drive flange. Apply locking compound to centre bolt. Reconnect propeller shaft.

Torques:

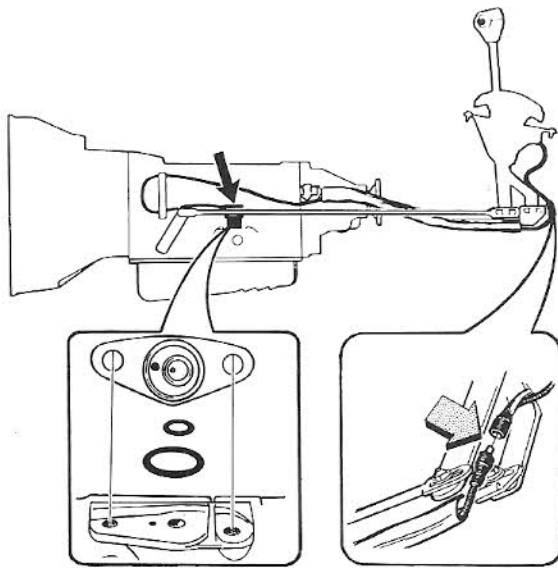
- Rear extension housing: **27–47 Nm** (20–35 ft.lb)
- Drive flange: **40–50 Nm** (30–37 ft.lb)

O6

**Add approx. 1 dl of fluid and check level**

**Important:** Use correct grade of fluid. See 'Specifications, transmission fluid'.

## Solenoid valve, replacement



P1

### Open connector on gearbox beside gear selector mechanism

Withdraw lead from protective sleeve and unhook from bracket.

P2

### Clean area around valve

P3

### Remove valve and O-rings

P4

### Install new valve and new O-rings

Use vaseline to hold O-rings in position. Tighten bolts.  
Torque: 10–16 Nm (7–12 ft.lb)

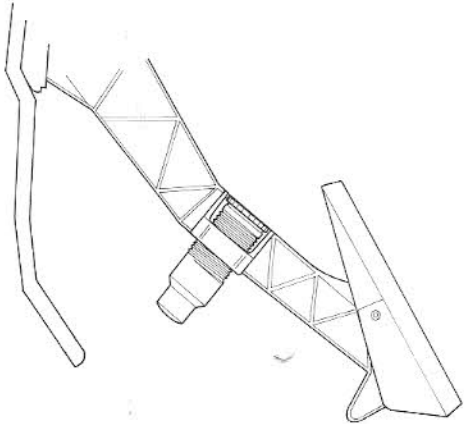
P5

### Insert lead in protective sleeve and rejoin connector

P6

### Check operation of valve

## Kickdown indicator, adjustment

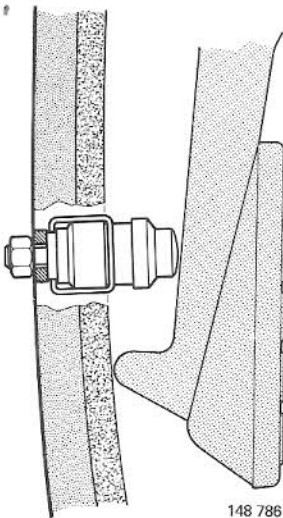


139 853

1985—

Q1

Screw up indicator into topmost position. Press accelerator pedal by hand until resistance is felt. Hold pedal in position and screw down indicator until it rests against floor.



148 786

—1984

Q2

Indicator is mounted in floor.

Undo indicator clip.

Screw down top section of indicator into bottom position.

Press accelerator pedal by hand as far as kickdown position.

Screw up top section of indicator until it is in contact with accelerator pedal and continue to turn to next locking position.

Resecure clip.

## Transmission replacement

Replacement of the transmission is described on pages 98–102 (for B 28 and B 280 engines) and pages 103–109 (B 204 and B 234). The procedure is generally applicable to other engine types.

In all cases, however, care must be taken to ensure that the distributor cover, connectors and hoses do not become jammed between the rear of the engine and the bulkhead.

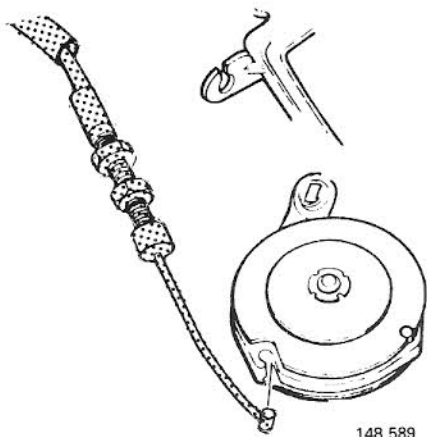
### Transmission replacement B 28, B 280 engines

Special tools: 5244, 5972

R1

Use universal fixture **5972** to remove and install automatic transmission. Ensure that centre of gravity of unit is located at centre of fixture.

Use socket **5244** to remove and install propeller shaft.



#### Removal

R2

##### Move gear selector lever to position P

Disconnect kickdown cable from throttle pulley.

Disconnect battery ground lead.

Drain transmission oil by disconnecting filler tube from sump.

**Caution!** Fluid may be extremely hot if car has recently been driven.

R3

**Strip transmission**

See operation R5.

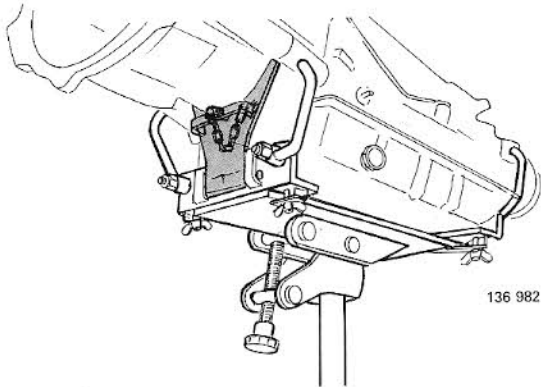
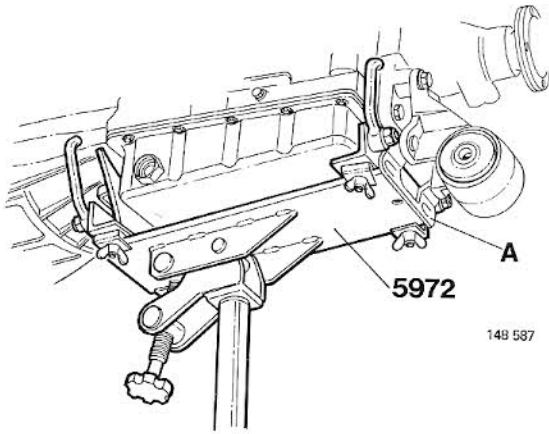
Leave two bottom torque converter housing bolts in position.

Undo nuts (two) securing mounting (A) to exhaust pipe bracket. Loosen a few turns and leave bracket attached to gearbox as support for fixture.

Bracket locks transmission to fixture in longitudinal direction.

Place fixture **5972** in position under gearbox.

Remove two lower bolts in torque converter housing.



R4

**Separate transmission from engine**

Remove carrier plate bolts.

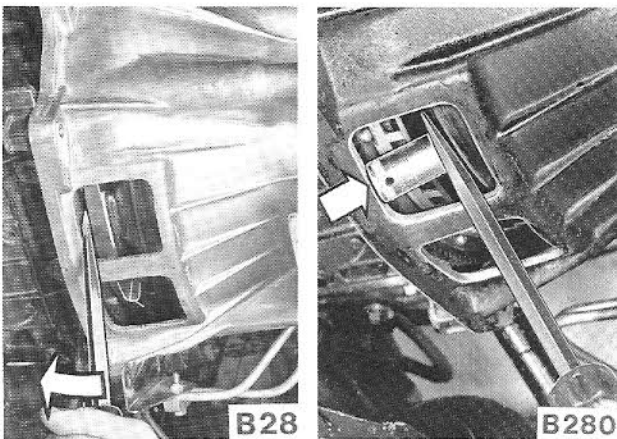
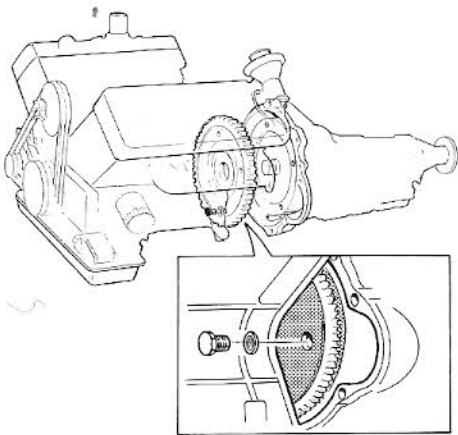
Prise apart torque converter and carrier plate.

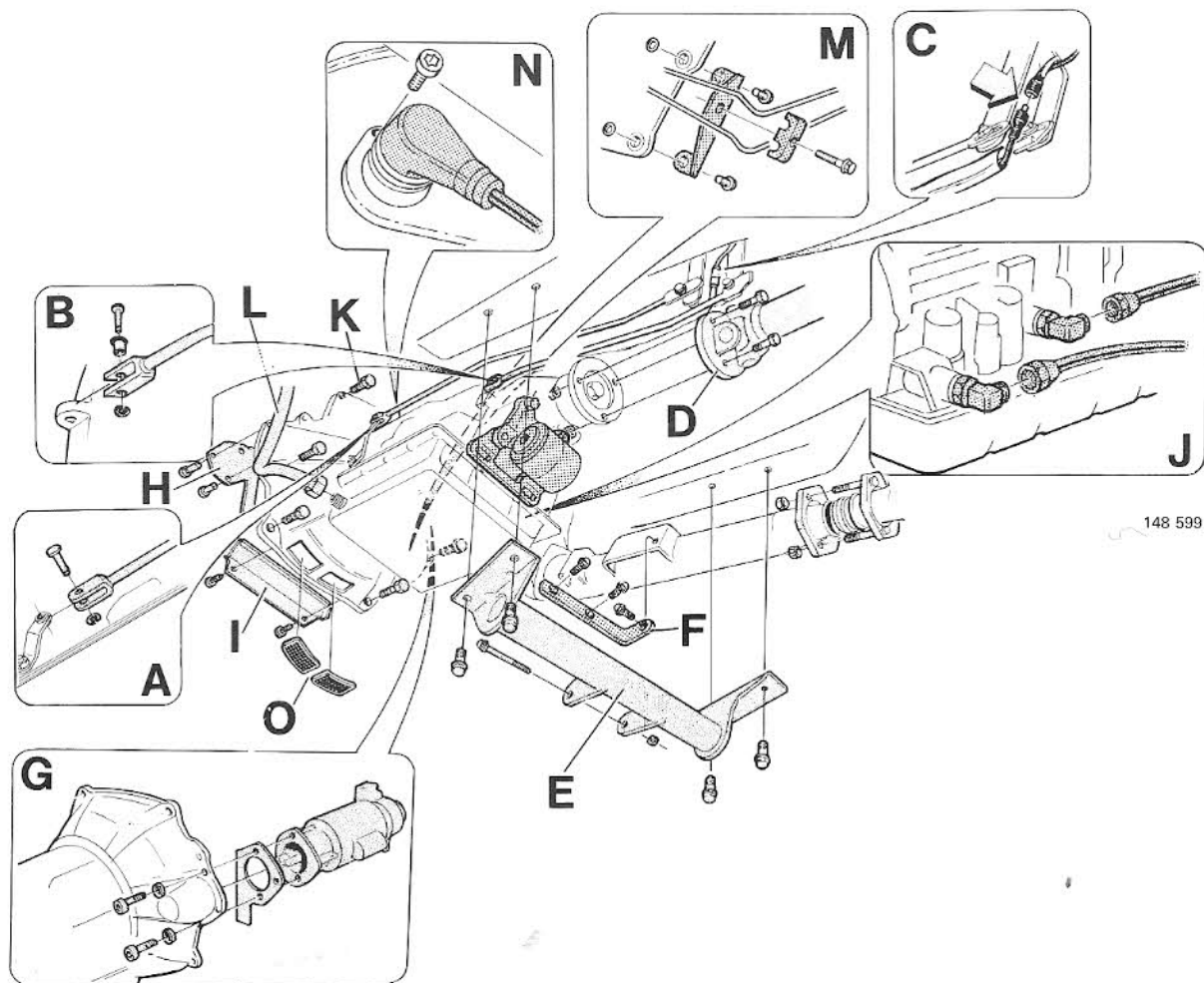
**Note:** On B 280 engine:

Position spacer between housing and screwdriver to protect timing wheel on flywheel.

Lower transmission.

**Caution!** Do not tilt transmission forward – torque converter may slip off shaft!

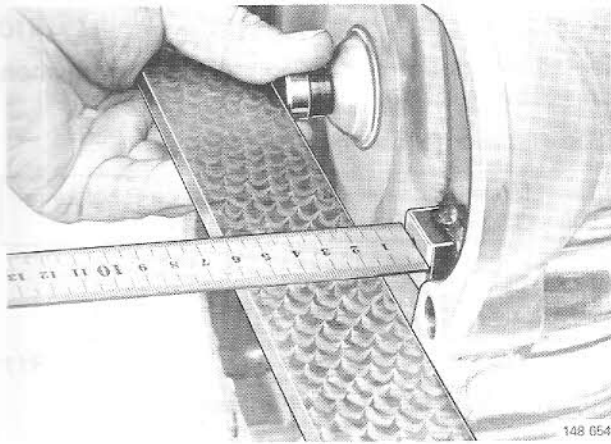




148 599

**Remove/disconnect:**

- |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>A. Control rod from gear selector link</li> <li>B. Reaction strut from gearbox housing</li> <li>C. Wiring to solenoid valve</li> <li>D. Propeller shaft from gearbox (use socket 5244)</li> <li>E. Transmission support member</li> <li>F. Exhaust pipe bracket (undo pipe joint and free bracket from pipe)</li> <li>G. Starter motor mounting bolts</li> </ul> | <ul style="list-style-type: none"> <li>H. Cover plate</li> <li>I. Cover plate at bottom of torque converter housing</li> <li>J. Oil cooler pipes</li> <li>K. Two upper bolts in torque converter housing</li> <li>L. Fluid filler tube</li> <li>M. Oil pipe bracket (remove from pipes)</li> <li>N. Timing pick-up</li> <li>O. Inspection covers on torque converter housing</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



148 654

## Installation

R6

### Check position of torque converter

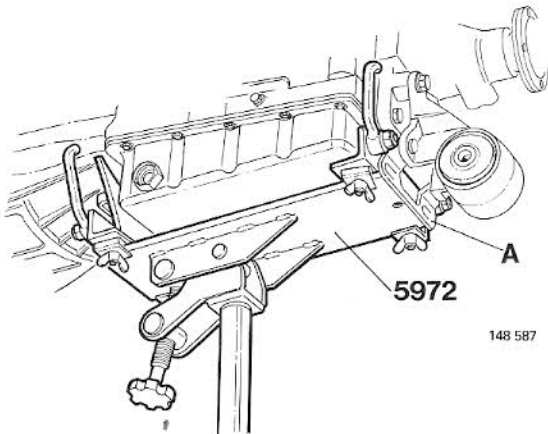
Place steel rule against converter housing. Measure distance between rule and converter mounting lugs.

Permissible clearance:

AW 70/71: 16.2–19.6 mm

AW 72 L: 15.5 mm

Coat torque converter guide and mating hole in crankshaft with a little grease.



148 587

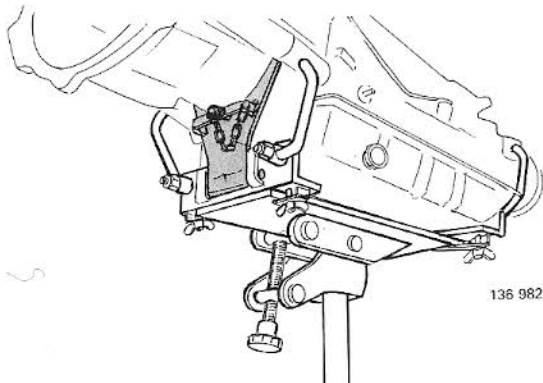
R7

### Use fixture 5972 to align transmission and engine

Use exhaust pipe bracket mounting (A) as support for fixture.

Ensure that torque converter housing is in firm contact with bell housing.

Adjust plate between starter motor and torque converter housing, and insert starter motor bolts. Insert two lower bolts in housing.



136 982

R8

### Install fluid filler tube

First, place tube in position against sump without tightening nut.

Attach tube bracket and insert two upper bolts in torque converter housing.

Tighten filler tube nut.

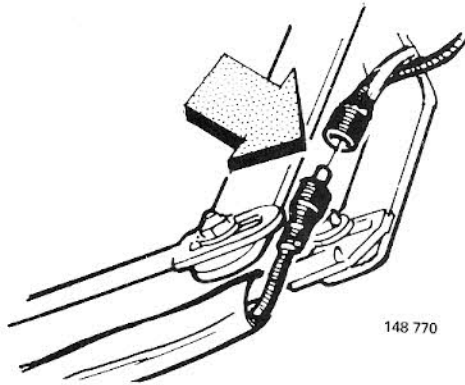
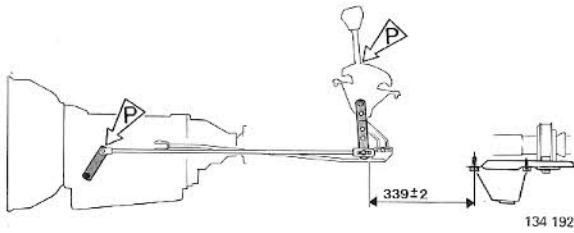
Torque: **80–100 Nm** (59–74 ft.lb)

R9

### Remove fixture 5972. Tighten exhaust pipe bracket mounting nuts (A)

Insert carrier plate bolts and tighten alternately.

Torque: **41–50 Nm** (30–37 ft.lb)



R10

**Install remainder of components removed when dismantling**

(See illustration for operation R5)

**Note:** Move gear selector lever to position P before re-connecting control rod.

R11

**Adjust gear selector mechanism**

See operations H1–H8.

R12

**Secure and connect solenoid valve lead**

(Applies only to gearbox with kickdown inhibitor)

R13

**Connect and adjust kickdown cable**

See operations J4–J10.

R14

**Fill unit with transmission fluid**

See operations B2–B4 (alternatively B5–B6) and B7–B10.

**Clean oil cooler**

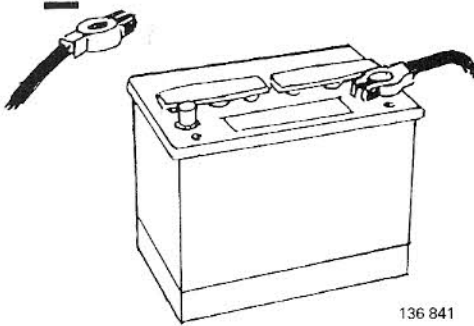
See operations C1–C2.

R15

**Check operation of transmission**

## Transmission replacement, B 204, B 234 engines

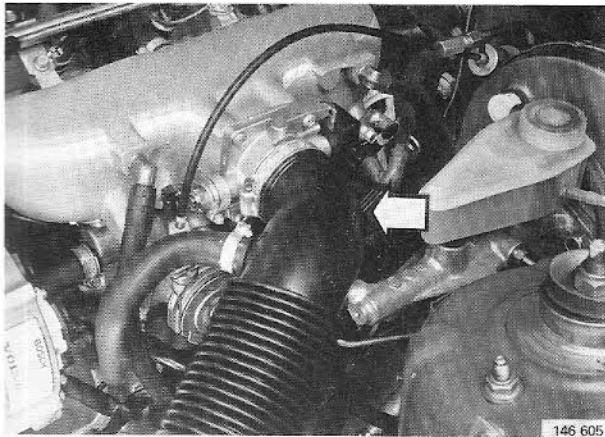
Special tools: 5006, 5033, 5115, 5186, 5972



### Removal

S1

**Disconnect battery ground lead**

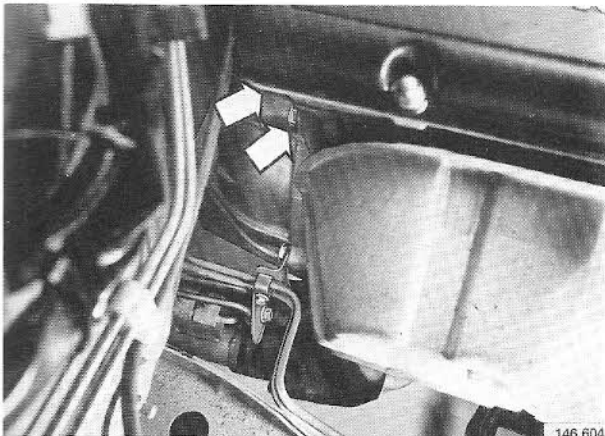


S2

**Release kickdown cable**

Remove transmission fluid dipstick.

**Note:** Cover dipstick tube opening.

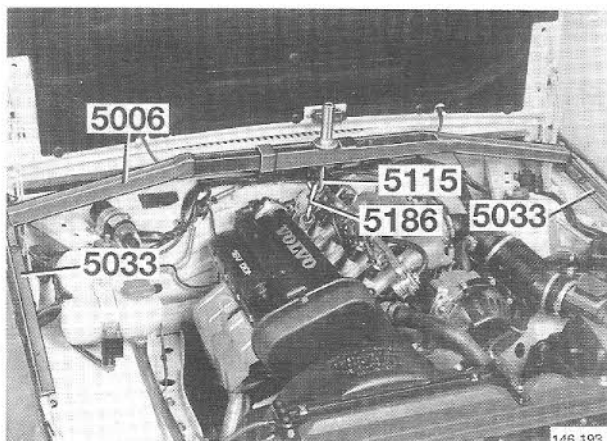


S3

**Remove front exhaust pipe mounting bolt from bracket**

Remove torque converter housing upper mounting bolts.

Remove oil pipe clamp.



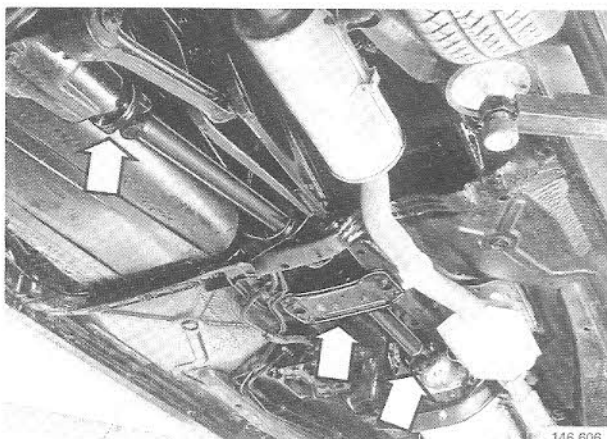
S4

#### Support engine at rear

Use support rails 5033, lifting beam 5006, and lifting hooks 5115 and 5186.

Use left rear lifting lug.

Take care to avoid damage to wiring harness.



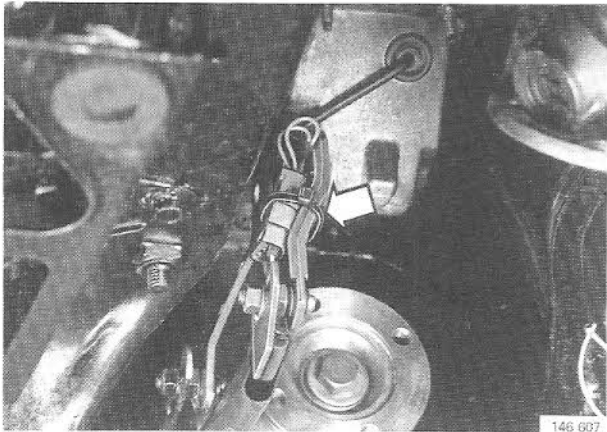
S5

#### Disconnect propeller shaft

Use socket 5244.

Separate front and rear couplings.

Release intermediate bearing from member.

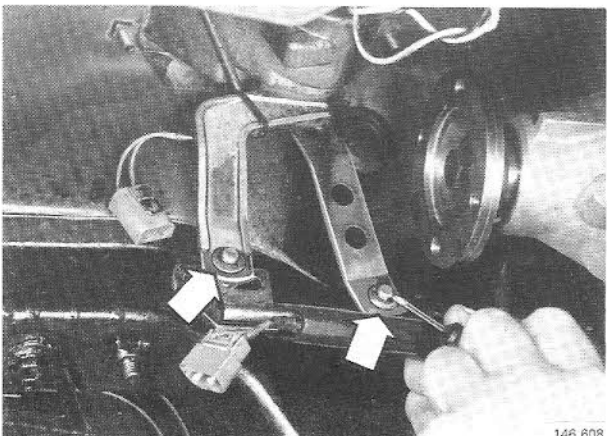


S6

#### Release transmission wiring

Cut lower cable tie at gear selector mounting.

Open wiring connectors.



S7

#### Free gear selector lever

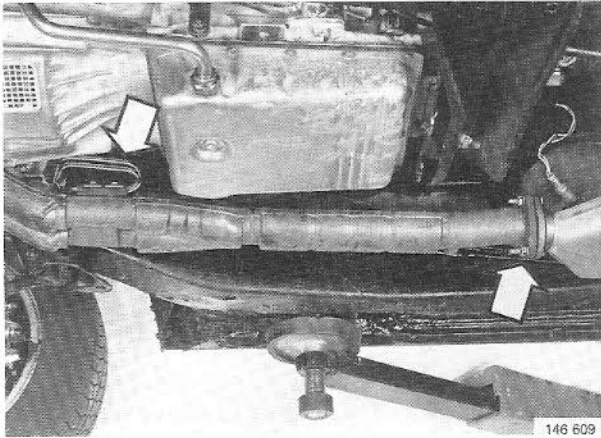
Remove circlips from control rod and reaction strut pivot points.

Remove rod and strut.

S8

**Undo bolted joint between exhaust pipe and catalytic converter**

Remove exhaust pipe front mounting bracket.

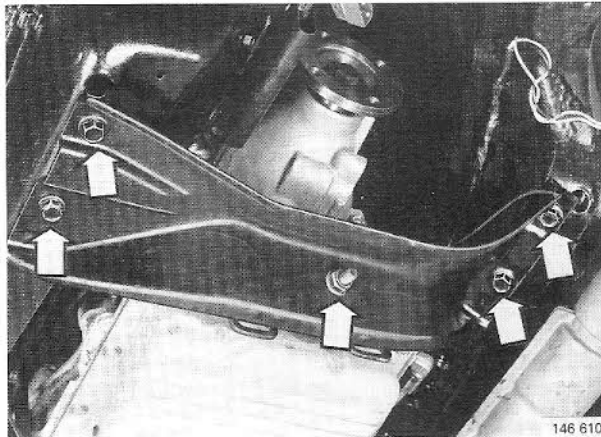


S9

**Drain transmission fluid**

Remove drain plug in sump and allow fluid to drain.

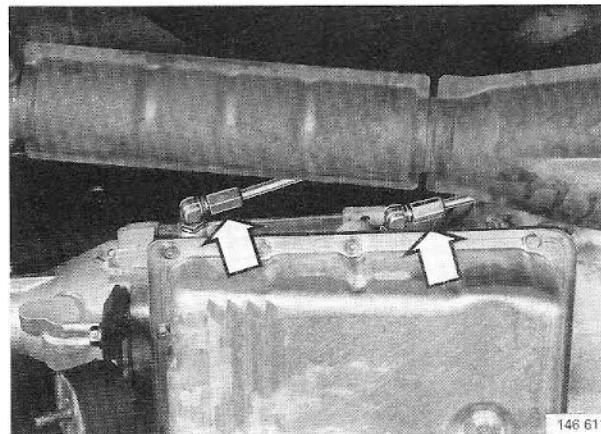
Refit plug when system has been drained.



S10

**Remove transmission support member**

Separate member from transmission bump stop and side members.

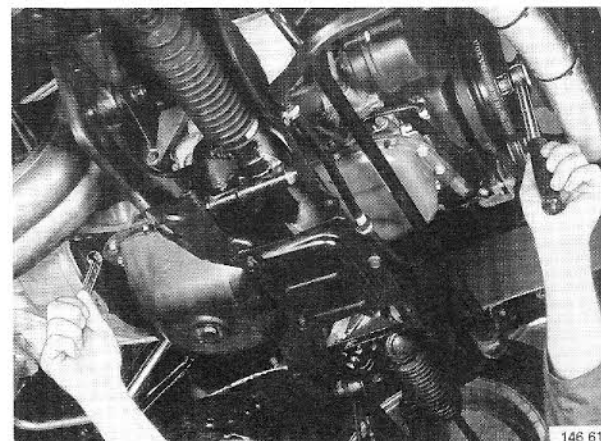


S11

**Disconnect oil pipes from gearbox**

Use container to collect spillage or mop up with paper.

Plug pipe connections.

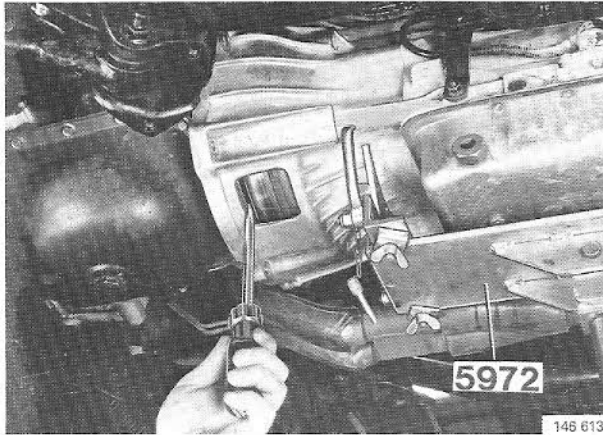


S12

**Remove fluid filler tube from sump**

**Remove:**

- Splashguard under engine
- Reinforcing bracket between engine and gearbox
- Torque converter mounting bolts in carrier plate
- Torque converter ventilation grille



S14

### Remove transmission

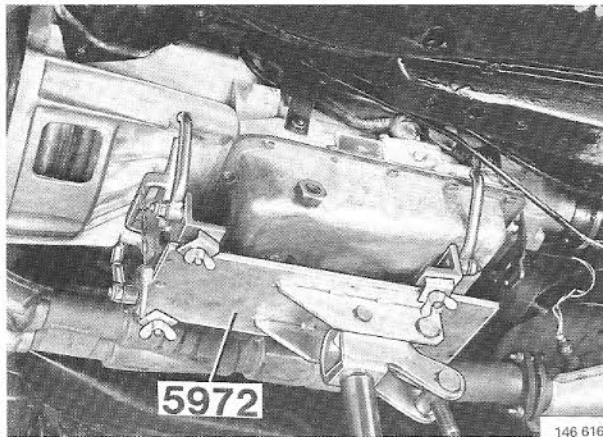
Use fixture 5972 to support unit.

Remove remaining mounting bolts in torque converter housing.

Carefully prise apart torque converter and carrier plate.

Lower transmission, tilting slightly backwards to ensure that torque converter does not slip off shaft.

**Note:** Position fixture 5972 and fork under front of gear-box.



### Installation

S15

### Install transmission

Use fixture 5972.

Check position of torque converter. (See operation R6.) Coat torque converter guide and mating hole in crankshaft with a little grease.

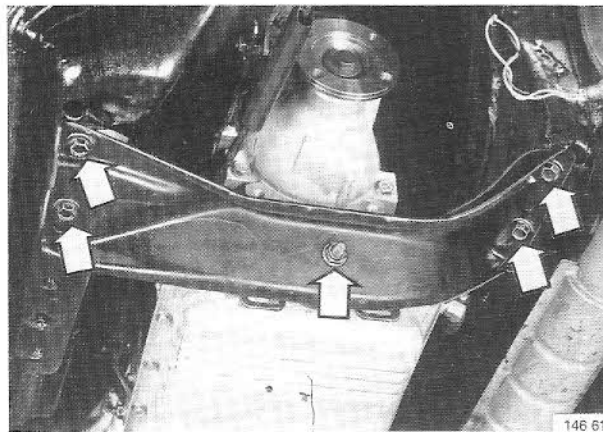
Raise transmission, tilting slightly backward.

Fit torque converter and carrier plate together. Ensure that torque converter housing is in firm contact with bell housing.

Tighten transmission in position. See 'Specifications' for torques.

Attach front exhaust pipe bracket to torque converter housing.

Remove fixture.

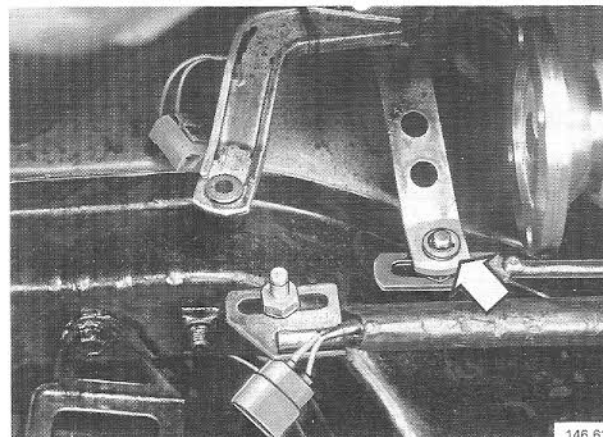


S16

### Install transmission support member

Tighten bolts securing member to side members.

Secure bump stop to member. Ensure that oxygen sensor (Lambdasond) lead is above member.



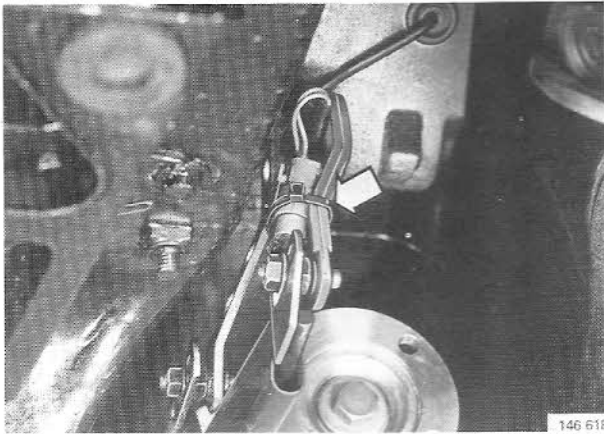
S17

### Reconnect gear selector lever

Reattach control rod and reaction strut to gear lever arm and reaction arm.

Refit circlips.

**Note:** Install flat washer in control rod pivot assembly.

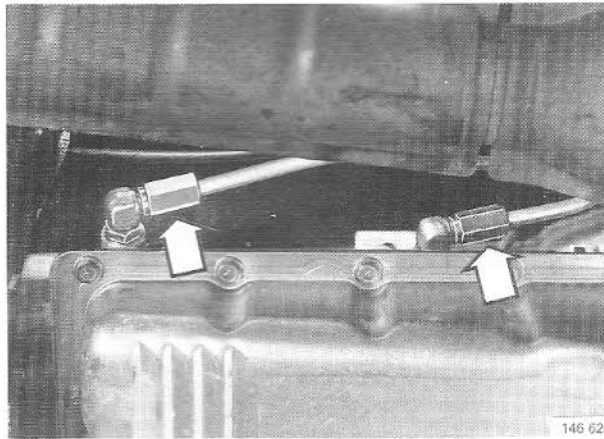


S18

**Reconnect transmission wiring**

Rejoin wiring connectors.

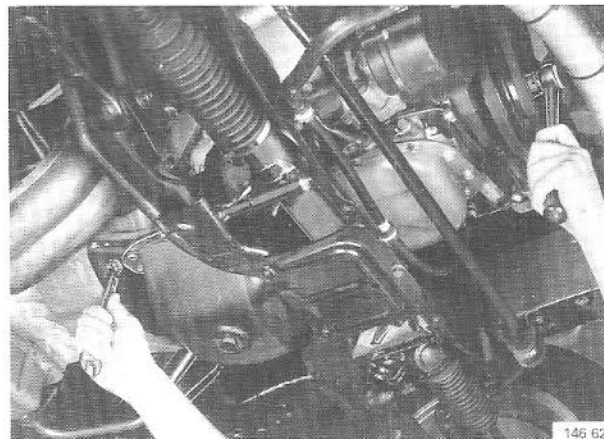
Secure wiring to selector lever mounting with cable tie.



S19

**Reconnect oil pipes**

Reconnect pipes to connections on gearbox and tighten nuts.



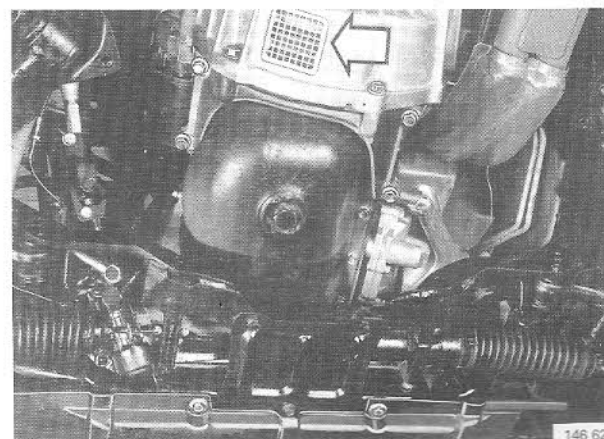
S21

**Secure torque converter to carrier plate**

Insert and finger-tighten all bolts.

Torque bolts alternately.

Torque: **45 Nm (33 ft.lb)**



S22

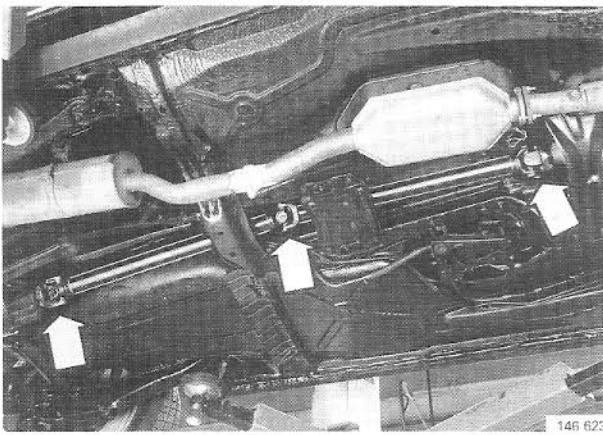
**Install reinforcing bracket**

Tighten bracket in stages.

Secure bracket to torque converter housing and then to cylinder block.

Install ventilation grille.

Install splashguard under engine.



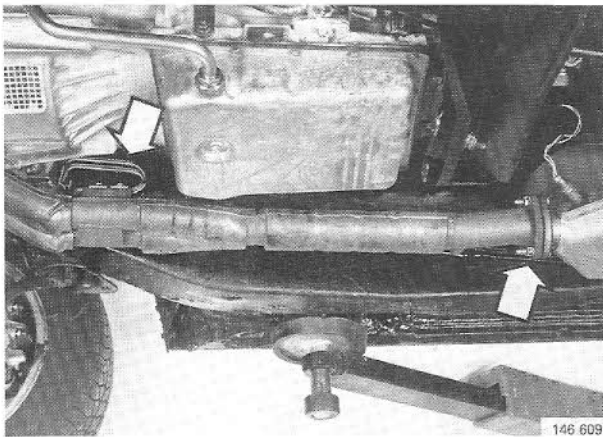
S23

**Install propeller shaft**

Use socket 5244.

Tighten front and rear drive couplings.

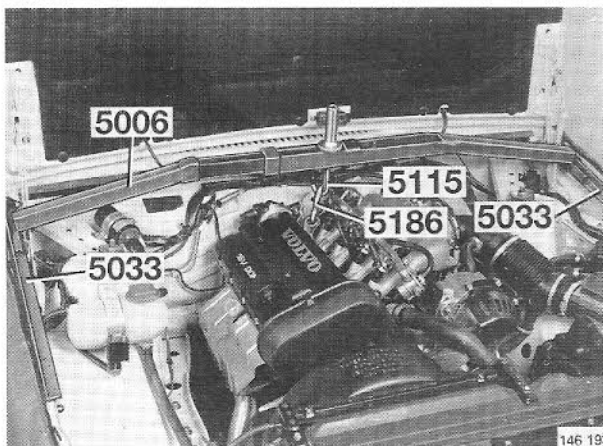
Remount intermediate bearing on support member.



S24

**Tighten flanged joint in front of catalytic converter**

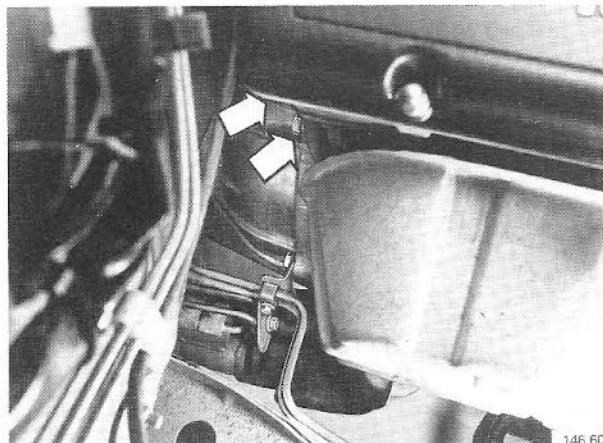
Install exhaust pipe front mounting bracket.



S25

**Remove lifting attachments**

Remove tools 5006, 5033, 5115 and 5186.



S26

**Tighten two upper bolts in torque converter housing**

Secure front exhaust pipe to bracket

S27

**Connect kickdown cable to throttle pulley**

Adjust cable as described in operations J7-J8.

S28

### Fill transmission with fluid

Adjust fluid level as described in operations A1-A4.

S29

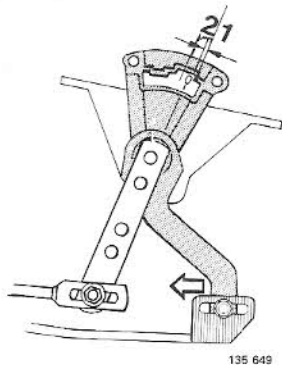
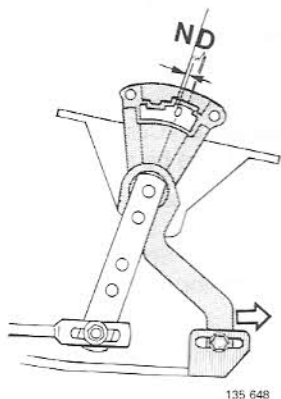
### Check operation of transmission

Reconnect battery ground lead.

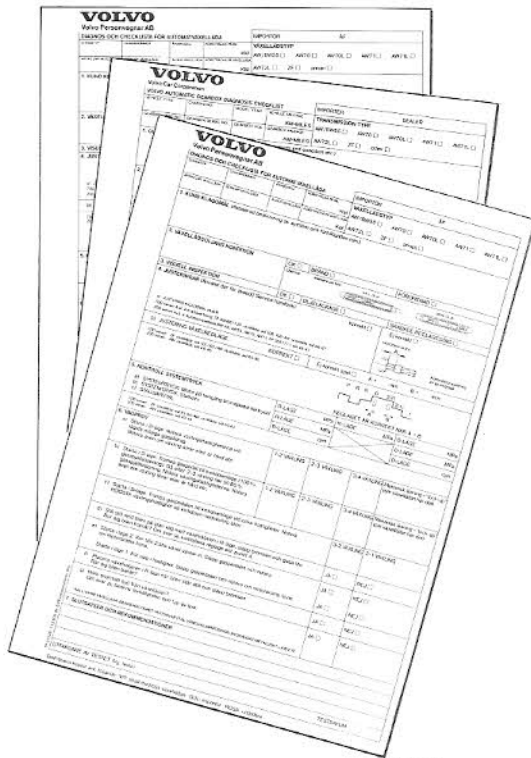
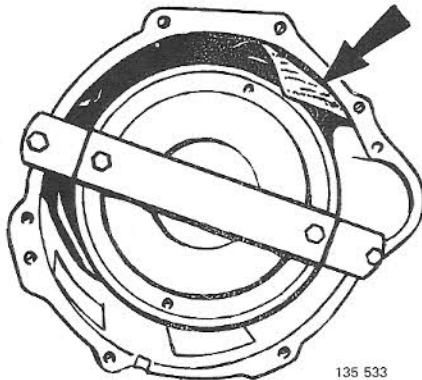
Check clearance of gear selector lever in positions D and N.

Clearance should be equal to or somewhat less than in positions 1 and 2.

Check transmission oil level.



## Exchange system – automatic transmissions



Automatic transmissions are reconditioned in a central workshop in markets which operate an exchange system.

Information on all fault symptoms observed prior to replacing the unit is essential if the fault(s) are to be correctly analyzed. This information should be supplied in the form of the 'Diagnostic and check list for automatic transmissions' (see below), which has been produced especially for the purpose.

Always fill in the boxes at the top. Describe all fault symptoms in plain text under the heading of 'Customer complaints'. Details of test drives should also be entered.

Place the completed report (white page) behind the torque converter to ensure that it is not lost. Put the report in a plastic sleeve to protect it against fluid. Send the yellow page to the importer/handling centre for registration. File the pink page.

Follow these instructions to facilitate fault tracing as part of reconditioning.

The foregoing applies to both warranty replacement and service replacement work.

**The diagnostic and check list is available from Volvo's Publications Department under the following numbers:**

- TP 31536/1 Swedish
- TP 31537/1 English
- TP 31538/1 French
- TP 31539/1 Spanish
- TP 31540/1 German
- TP 31541/1 Dutch
- TP 31542/1 Italian

**Faults in the following may be corrected without removing the transmission from the car.** (These are not accepted as justification for installing an exchange unit):

- Fluid level
- Fluid leakage, except from torque converter and oil pump
- Kickdown cable
- Gear selector mechanism
- Parking lock
- Valve bodies
- Governor
- Rear extension housing, drive coupling, speedometer drive and oil seal
- Control system
- Accumulator pistons
- Solenoid valve
- Oil pressure switch (units with kickdown inhibitor only)
- Lock-up function (control system)

**The following may be repaired in fixture 5972 or when the transmission has been removed from the car.** (Exchange unit need not be installed):

- Fluid leakage from torque converter or oil pump
- Torque converter
- Torque converter housing

### Installation of exchange unit

See operations R7-R15 (B 28, B 280) or S15-S29 (B 204, B 234) as appropriate.

It is extremely important that the instructions be followed and the work completed prior to road testing, otherwise the transmission may be damaged. Failure to comply with this procedure may result in the rejection of a claim.

**Note:** Ensure that the oil cooling system is thoroughly cleaned prior to road testing. See operations C1-C2.

# Notes

A series of horizontal dotted lines for writing notes, spanning the width of the page.



VOLVO SUPPORTS VOLUNTARY  
MECHANIC CERTIFICATION  
BY THE N.I.A.S.E.

(U.S.A. only)

*Service literature*

*Your  
most important  
special tool*

TP 31642/1  
2500.09.90  
USA